Brief Table of Contents of Volume IV.

Pages

JOHN DAVID BOND (*Knoxville, Tenn.*). — The development of trigonometric methods down to the close of the XVth century (with a general account of the methods of constructing tables of natural sines down to our days) 295

RICHARD WALLINGFORD (1292?-1335) 459

PIERRE BOUTROUX (*Paris*). — L'enseignement de la mécanique en France au XVII[e] siècle 276

FLORIAN CAJORI (*Berkeley, Cal.*). — Note on the FAHRENHEIT scale 17

On the history of caloric. 483

CHARLES H. HASKINS (*Cambridge, Mass.*). — MICHAEL SCOT and FREDERICK II 250

J. W. S. JOHNSSON (*Copenhagen*). — HENRIK HARPESTRAENG. A Danish Salernitan 13

HÉLÈNE METZGER (*Paris*). — L'évolution du règne métallique d'après les alchimistes du XVII[e] siècle 466

G. A. MILLER (*Urbana, Ill.*). — Different types of mathematical history 5

GEORGE SARTON (*Cambridge, Mass.*). — An introduction to the history and philosophy of science (preliminary note). 23

The principle of symmetry and its applications to science and to art 32

The teaching of the history of science (2nd article) . 225

Critical Bibliography of the History and Philosophy of Science and of the History of Civilization :

Tenth, to April 1921. 124

Eleventh, to October 1921. 390

Twelfth, to March 1922. 572

For the Notes and Reviews see the Summaries of each separate number on p. 1-4, 221-223, 455-458.

ISIS

International Review devoted to the History of Science and Civilization.

SUMMARY

of No. 10 (Vol. IV, 1)
(Edited in Cambridge, Massachusetts, May 1921.)

I. *Main Articles.*

Pages

G. A. Miller *(Urbana, Ill.)*. — Different types of mathematical history 5

J. W. S. Johnsson *(Copenhagen)*. — Henrik Harpestraeng. A Danish Salernitan 13

Florian Cajori *(Berkeley, Calif.)*. — Note on the Fahrenheit Scale 17

George Sarton. — An Introduction to the History and Philosophy of Science (preliminary note) 23

George Sarton. — The Principle of Symmetry and its applications to Science and to Art 32

II. *Notes and Correspondence.*

Mathematics. L'Encyclopédie des Sciences mathématiques (G. S.) . 39

Geography. Philip Lee Phillips' contributions to the bibliography of cartography (G. S.) 40

Hans Peder Steensby, 1875-1920 (J. W. S. Johnsson) 43

Technology. The organization of research in the history of technology on a commercial basis (G. S.) 44

Iconography. Medals and other portraits of scientists (G. S.) . . . 45

III. *Reviews.*

S. I. A. C. Lucrèce. De la Nature. Texte et trad. par Alfred Ernout, Paris, 1920 (G. S.) 47

S. XI. Steensby, H. P. The Norsemen's route from Greenland to Wineland. Copenhagen, 1918 (G. S.) 48

Pages

S. XV. CERMENATI, MARIO (*editor*). Per il IV° centenario della morte di Leonardo da Vinci. Bergamo, 1919 (G. S.). . . . 48

S. XVI. JAEGER, F.M. Contributions to the history of science in the Netherlands during the XVIth and XVIIth centuries. (in Dutch.) Groningen, 1919 (G. S.). 50

HELLMANN, G. Aus der Blütezeit der Astrometeorologie. STÖFLERS Prognose für das Jahr 1524. Berlin, 1914 (G. S.). 51

ANTHIAUME, A. Cartes marines, constructions navales. Voyages de découverte chez les Normands, 1500-1650. Paris, 1916 (G. S.) 52

TAYLOR, H. O. Thought and Expression in the sixteenth century. New York, 1920 (G. S.). 52

S. XVII. SPERLINGS, OTTO. Studienjahre, hrg. v. WATTER G. Brieger und J. W. S. JOHNSSON. Kopenhagen, 1920 (G. S.). . 54

BLANCHET, LÉON. Campanella. Paris, 1920 (G. S.) . . . 55

BADDELEY, JOHN F. Russia, Mongolia, China. London, 1919 (G. S.) 85

Antiquity. DUSSAUD, RENÉ. Les civilisations préhelléniques dans le bassin de la mer Egée. 2e éd. Paris, 1914 (G. S.). 56

Egypt. WALLIS BUDGE, Sir E. A. An Egyptian hieroglyphic dictionary. London, 1920 (G. S.) 57

Greece. MARSHALL, F. H. Discovery in Greek lands. Cambridge, 1920 (G.S.). 59

India. BANERJEE, G. N. Hellenism in ancient India. 2d ed., Calcutta, 1920 (G. S.) 59

WOODS, J. H. The Yoga-System of Patañjali. Cambridge, Mass. 1914 (P. MASSON-OURSEL). . . . 60

SPEYER, J. S. Die indische Theosophie. Leipzig, 1914 (P. MASSON-OURSEL) 61

WINDISCH, E. Geschichte der Sanskrit-Philologie und indischen Altertumskunde. 1 Teil. Strassburg, 1917 (P. MASSON-OURSEL) 61

WINTERNITZ, M Geschichte der indischen Literatur. Leipzig, 1909-1913 (P. MASSON-OURSEL) 62

Islam. ABÛ-MANṢÛR ʿABD-AL-KÂHIR IBN-ṬÂHIR AL BAGHDÂDÎ. Moslem schisms and sects. New York, 1920 (G. S.). 63

GOLDZIHER, IGNAZ. Le dogme et la loi de l'Islam. Paris, 1920 (D. B. MACDONALD). 64

RUSKA, JULIUS. Zur ältesten arabischen Algebra und Rechenkunst. Heidelberg, 1917 (KARPINSKI). . . 67

		Pages
Japan.	ENDÔ, T. History of Japanese mathematics. 2d ed. (in Japanese) Tokyo, 1918 (MIKAMI)	70
	Japan Civilization Society. Science in Japan (in Japanese). Tokyo, 1917 (MIKAMI)	72
	MIKAMI, Y. The causes of the development of mathematics in Japan (in Japanese). (MIKAMI)	75
	MIKAMI, Y. Magic squares in Japanese mathematics (in Japanese). Tokyo, 1917 (MIKAMI)	76
	KANETSUNE, S. Music in Japan (in Japanese). Tokyo, 1912 (MIKAMI)	77
	TANABE, H. Lectures on Japanese music (in Japanese). Tokyo, 1919 (MIKAMI)	77
Archaeology.	GRAESSE, J. G. TH. Kunstgewerbliche Altertümer. 6te Aufl. Berlin, 1920 (G. S.)	82
Biology.	THOMSON, J. A. The system of animate nature. London, 1920 (G. S.).	82
Chemistry.	JAEGER, F. M. Elements and atoms of old and now (in Dutch). Groningen, 1920 (G. S.)	83
	DELACRE, M. Histoire de la chimie. Paris, 1920 (L. GUINET)	84
Geography.	BADDELEY, JOHN F. Russia, Mongolia, China. London, 1919 (G. S.).	85
History.	NORDEN, EDUARD (editor). Vom Altertum bis Gegenwart. Leipzig, 1919 (G. S.).	89
Logic.	RIGNANO, EUG. Psychologie du Raisonnement. Paris, 1920 (G. S.).	90
Mathematics.	BOUTROUX, P. L'idéal scientifique des mathématiciens. Paris, 1920 (G. S.)	93
	BOUTROUX, P. Les principes de l'analyse mathématique. t. II. Paris, 1919 (J. M. CHILD.)	96
	DICKSON, L. E. History of the theory of numbers. Vol. II. Diophantine analysis. Washington, 1920 (J. M. CHILD)	107
	WIELEITNER, H. Geschichte der Mathematik, II, 2. Berlin, 1921 (D. E. SMITH)	109
Medicine.	PREISLER. Bibliographischer Führer durch die medizinische Literatur. Copenhagen, 1920 (G. S.). . .	109
Science, history.	DANNEMANN, F. Die Naturwissenschaften in ihrer Entwicklung und in ihrem Zusammenhange. 2te Aufl., I. Bd. Leipzig, 1920 (G. S.).	110

		Pages
Science, history.	ZEITLINGER, H. Bibliotheca Chemico-Mathematica. London, 1921 (G. S.)	111
	MIELI, A. (editor). Gli scienziati italiani. Vol. I, 1. Roma, 1921 (G. S.)	112
Science, organ.	PAUCOT, R. Le rôle des sciences dans l'éducation. Paris, 1920 (L. GUINET.)	114
Science, philos.	LECLERC DU SABLON, M. L'unité de la science. Paris, 1919 (L. GUINET.)	115
	HOUSSAY, FR. Force et cause. Paris, 1920 (L. GUINET.) .	115
	NAVILLE, A. Classification des sciences. 3e éd. Paris, 1920 (G. S.)	118
	WESTAWAY, F.W. Scientific Method. New ed. London, 1919 (G.S.)	119
	WESTAWAY, F.W. Science and Theology. London, 1920 (G.S.) .	119
Sociology.	SAND, RENÉ. Organisation industrielle, médecine sociale et éducation civique en Angleterre et aux États-Unis. Bruxelles, 1920 (G.S.)	122

IV. *Tenth Critical Bibliography of the History, Philosophy and Organization of Science and of the History of Civilization* (to April 1921) 124

Different types of mathematical history

Among the various general histories of mathematics the two written by J. E. MONTUCLA and M. CANTOR were especially favorably received. The former of these is frequently spoken of as the earliest real history of our subject and served to a large extent as a prototype for the latter and for many other less influential undertakings along this line. It is therefore of interest to consider some of the characteristic features of these two works. One of the most striking features is that their authors express their own opinions in no uncertain terms on a large number of fundamental questions. These authors did not seem to endeavor to efface themselves but they present fearlessly conclusions which they had reached after investigating thoroly the various evidences available in their days, and they often supplement facts in somewhat the same manner as lost Greek works used to be restored from the notes of PAPPUS and others.

The many appreciative comments which these histories have evoked tend to show that a considerable body of readers of general histories of mathematics desires not only the evidences but also the conclusions gained by men who were in position to consider these evidences carefully and comparatively. The many lofty and inspiring remarks which those thoroly familiar with the history of our subject are in position to make constitute features which are more attractive to most readers than collections of facts without any attempt to interpret them. Such collections are, however, also useful, but they are apt to detract from the readability of a general history of our subject, and an essential element of usefulness of such a history is that it is actually read.

An important difference between the history by MONTUCLA and that by CANTOR is that pure and applied mathematics are considered by the former author while the latter confined himself to pure mathe-

matics. In the preface to the former work we are told that its author had also at first expected to confine himself to pure mathematics but decided to include the history of applied mathematics in order to reach a larger number of readers. He seemed to feel uncertain that this extension of the scope of his work, which was partly due to the advice of friends, was wise.

Both MONTUCLA and CANTOR treat not only the history of mathematics but also the history of some of the most noted mathematicians, and both authors aim to give clear explanations of the fundamental concepts whose history is presented as well as an outline of the political situations at the times when mathematical advances were made. The former of these features has been widely adopted even by authors of brief general histories of our subject. The latter feature has been less commonly adopted, but it is the more serious of the two, since it is becoming more and more easy to supply biographical information by means of general works of reference. On the other hand, it is becoming more and more difficult for the non-professional mathematician to secure a clear view of the fundamental elements involved in modern mathematical advances.

MONTUCLA laid great stress on securing clear ideas of the mathematical concepts before writing on their history, and it seems obvious that a reader cannot secure a deep insight into the history of any scientific subject without first acquiring a thoro knowledge of this subject itself. It is only then that he is in position to understand the significance of the various advances made at different times. This is especially true of mathematics in view of the interdependence of the different branches, and the fact that the more advanced theories cannot, as a rule, be understood without first mastering various special elements involved therein. Probably one of the main reasons why so few mathematicians are especially interested in the history of their subject is that they expect to be better prepared later to take up this subject.

A disadvantage of the types of treatments adopted by MONTUCLA and CANTOR is that such treatments require a large amount of space. For instance, if the material found in the recent second edition of CAJORI's *History of Mathematics*, 1919, were to be treated in this manner, twenty volumes would probably have been needed instead of the one in which we find it presented. It would evidently have been possible to restrict the number of topics treated and to present these few topics with full explanations of their mathematical significance and their historical

connections, but many readers doubtless prefer the « bird's-eye-view of the development of mathematics from its earliest beginnings to the present time », which the author aims to give here, even if many of the technical terms employed by him convey vague notions.

As a matter of fact we need different types of histories of our subject and it seems almost puerile to consider the question which type is the most important in a general way. The different types appeal to different classes of readers, and the healthy growth of our subject and its service to humanity as a whole demand that the needs of all of these readers should be met to the largest possible extent. The main question is whether a history is reasonably well suited to meet the needs of the class which it is intended to reach. Histories in which the reader is not expected to understand the mathematical significance of many of the concepts have the advantage of brevity and of freedom to read lightly or more seriously as one may desire. If the question, understandest thou what thou readest ? were asked by a Philip of readers of such a history, various answers might be expected. Some might answer in the old familiar words, how can I except some man should guide me ? Others might be inclined to reply, why should I try to understand ? I am reading a history of modern mathematics. It is too much to ask one to study a subject and its history at the same time.

The reader of mathematical history who does not specialize along this line is usually not in position to verify many of the historical statements found in books on this subject, and hence he is naturally greatly interested in securing information relating to the relative accuracy of these books. It is therefore the more singular that in the past the accuracy or lack of accuracy seem to have effected only slightly the popularity of histories of our subject. For instance, F. Hœfer's *Histoire des Mathématiques* was first published in 1874. In the review of it which appeared in the *Jahrbuch über die Fortschritte der Mathematik* two years later, the reader is earnestly warned against the errors of this book. The nature of this review may be inferred from the following sentence which was printed in italics : « Errors of thought and type alternate so elegantly in this book that one must ask oneself whence the author has taken the little that is correct ». Notwithstanding this severe and deserved criticism, the book was reprinted at various times and reached its fifth edition in 1902.

Another singular fact is that even the best of the older general mathematical histories are now worse than useless for the beginner since they contain much that must be unlearnt by those who read

them before they are acquainted with the discoveries of recent years relating to the history of our subject. The fact that we now know that many of the views held by leading mathematical historians fifty years ago are erroneous is not very encouraging if we can reasonably expect that those who will live fifty years after our times will discard many of the views which are championed by the mathematical historians of the present day. Fortunately this is not the case.

The fact that during the latter half of the nineteenth century the foundations of mathematics were re-examined and older views were subjected to severe criticisms may justify the hope that views on historical questions which stood the test of this age are not likely to rest on insecure foundations. It is, of course, to be expected that additional light will be thrown on many questions by later discoveries, but the fact that our mathematical historians are now confessing ignorance as regards such fundamental questions as when our common number symbols originated and why the circle was divided into 360 equal parts are hopeful signs. The praiseworthy attitude of many mathematical historians to weigh evidences and interpret facts will, however, probably always deprive this subject of the finality as regards reliability which is a property of most of the other mathematical literature.

To illustrate the difficulty encountered in weighing evidence we may refer to the statement that the Chinese seem to have known as early as 500 B. C. that $2^p - 2$ is divisible by the prime p in L. E. Dickson, *History of the Theory of Numbers*, Vol. I (1919) p. 59. This statement is based upon a note written by J. H. Jeans and published in the *Messenger of Mathematics*, volume 27 (1898), page 174, where it is noted that this theorem is contained in a paper found among those of Sir Thomas Wade and dating from the time of Confucius. It is difficult to determine how much weight should be assigned to such evidence in view of many unwarranted claims made by Chinese writers as regards historical questions, and the fact that the theorem does not seem to be in accord with the mathematical attainments of the Chinese at this early period.

The functions of the author of a mathematical history vary with the type of history he aims to produce. If this history is restricted to a comparatively small field, the main object may be to secure a complete list of the advances made in this field with indications relating to their nature and interrelations. As the field to be covered is enlarged and the amount of available space for details is decreased, the function of

the author becomes more and more judicial. In a brief general history of our subject the author is compelled to exercise the judicial function in the selection of his material as well as in the treatment hereof, unless his knowledge is so limited that he has enough space to say all he knows about particular subjects, which is unlikely. Perhaps the most difficult function of the author of a small history of our subject is that of a judge of relative values and the significance of particular developments.

It may be of interest to note here a few outstanding facts in regard to general histories of mathematics in the English language. The small number of such works and the small extent of those which have appeared tend to raise questions as regards possible explanations which do not reflect on the general mathematical interests of English speaking people. Each of these histories which first appeared in our language was confined to one volume and seems to have had for its main object a popular presentation of the principal facts relating to the history of our subject rather than a contribution to the knowledge relating thereto. Moreover, only smaller histories have been translated into English, beginning with the French work by BOSSUT which appeared in English in 1803.

Two modern English histories of mathematics which aim to cover the entire field are *A Short Account of the History of Mathematics* by W. W. R. BALL, first published in 1888, and *A History of Mathematics* by FLORIAN CAJORI, first published six years later. A fifth edition of the former appeared in 1912 and various corrections and additions were made, especially in the second edition, issued in 1893, but the fifth edition does not differ widely from the first. On the other hand, the second edition of CAJORI'S work, issued in 1919, is about twice as large as the first and differs widely therefrom, especially as regards the treatment of the mathematical developments since the beginning of the nineteenth century.

BALL'S *Short Account* was translated into Italian and enlarged by the translator, appearing in two volumes in 1903 and 1904. A few years later an enlarged French translation appeared also in two volumes. The first edition of BALL'S book was quite unsatisfactory from a scientific standpoint as it was based largely on antiquated works. The later editions exhibit considerable improvement but even the fifth edition failed to embody some of the desirable changes to which attention had been called in the various reviews of this work. Its popularity seems to be due to its readableness rather than its accu-

racy. It contains a considerable number of biographical sketches of leading mathematicians of all times.

As the second edition of CAJORI's work is more recent it may be desirable to enter into somewhat greater details in its analysis. Its author added, soon after its publication, two pages, 515 and 516, devoted to additions and corrections. These naturally relate mainly to minor matters since the more serious desirable changes can usually not be properly treated in a few words. In fact, the latter often relate to incorrect impressions conveyed by various statements even when the statements taken separately are substantially correct.

As an instance of this kind we may refer to the following two sentences which appear on page 302 of the work under consideration. « EUCLID proved (I, 27) that — if a straight line falling on two other straight lines make the alternate angels equal to one another, the two straight lines shall be parallel to one another. — Being unable to prove that in every other case the two lines are not parallel, he *assumed* this to be true. »

The natural impression conveyed by these two sentences is that EUCLID proved the theorem mentioned in the former sentence without making the assumption to which reference is made in the latter. Such an impression is incorrect and is the more unfortunate since it is related to a fundamental fact in the history of elementary geometry. EUCLID proved this theorem by first assuming its converse and this converse is practically the assumption to which the second sentence refers. Each of the two sentences quoted above would be correct, with the exception of an obvious misprint, if it were placed in its proper environment, but as these sentences stand in the text they are apt to convey a very unfortunate impression.

It is the impression conveyed by a number of sentences or by whole pages which is the most important element of a history of mathematics, and if such a history is largely made up of statements taken in substance from various sources without being fully digested it is very apt to convey more false impressions than the actual inaccuracies in individual sentences would seem to indicate. In view of the great variety of subjects covered in a history of modern mathematics, it seems almost inevitable to introduce to some degree false impressions into such a history even when each statement taken by itself is practically correct.

The reader who realizes this difficulty can use to great advantage a work which otherwise might be harmful to him. For instance, if such

a reader finds the following statements, on page 325, « what is a curve? CAMILLE JORDAN in his *Cours d'analyse* defined it tentatively as a *continuous line* », he realizes that this cannot be meant as an actual definition. On reading further he will find various interesting and useful statements about curves, with proper references. While he may feel that the subject should have been presented in a much clearer way, even in the very limited amount of space devoted thereto, he must admit that many of the important elements of the history of curves are actually noted.

Perhaps one of the worst instances where false historical impressions are apt to be conveyed is found on page 131. In speaking about Germany it is here stated that « she produced REGIOMONTANUS, COPERNICUS, RHETICUS, and KEPLER, at a period when France and England had, as yet, brought forth hardly any great scientific thinkers ». The natural inference from this statement is that Germany made important scientific progress at an earlier date than France and England, while the reverse is actually the case. In particular, ROGER BACON was scientifically active and antedated all of those named above, and the mathematicians of France and England who belonged to no later period than KEPLER include VIETA, ORESME, NAPIER, BRIGGS, and many others.

Another instance where the reader who is not well informed as regards mathematics is apt to be misled in regard to a fundamental matter is found on page 164, where the following sentence in regard to a method used by FERMAT appears : « The main difference between it and the rule of the differential calculus is that it introduces the indeterminate quantity e instead of the infinitely small dx. » Little lower on the same page we read that « FERMAT introduced the conception of infinitely small differences between consecutive values of a function ».

As there is no essential difference between FERMAT's method and our modern method of finding the derivative, except as regards notation, the reference to the indeterminate e and the infinitely small dx is misleading, especially since this e is implied to be infinitely small in the second quotation just noted. As these remarks relate to fundamental questions in the differential calculus where the progress of the student is so apt to be retarded by slight misconceptions, it is especially important that clear statements relating thereto should have been made.

It is not our purpose in this brief analysis of the second edition of CAJORI's history of mathematics to direct attention to all the desirable

modifications which ere not noted in the published lists of corrections. This edition is more accurate than the first edition was, and the popular style in which it is written will doubtless win for it many readers and secure for it a wide field of influence. Even the professional mathematician will find here much that should prove to be helpful and inspiring, and teachers of mathematics will find much that will clarify the historical notes found in their textbooks. The man who is mainly interested in the history of science as a whole and turns to a history of mathematics for the purpose of securing an insight into this particular part of the general history of science will find CAJORI's work especially useful for the purpose of obtaining a superficial but extensive knowledge of recent developments in mathematics.

The most noteworthy recent contribution to the history of our subject is DICKSON's *History of the Theory of Numbers*, the first two volumes of which appeared in 1919 and 1920 respectively (1). This is a *reference* history on the subject treated as may be inferred from the following quotation found in the preface to the second volume : « what is generally wanted is a full and correct statement of the facts, not an historian's personal explanation of these facts. The more completely the historian remains in the background or the less conscious the reader is of the historian's personality, the better the history ».

These few observations relating to types of mathematical histories and to a brief analysis of a few of the most popular general histories of mathematics are intended to be useful to the historian of science in general rather than to the specialist in mathematics. They may serve to emphasize the fact that mathematical history is still in a somewhat primitive condition, especially in the English language, and that more work along this line is highly desirable. They are also intended to aid in creating a more critical attitude as regards the popular general histories of mathematics in the hope that such an attitude may lead to improvement.

G. A. MILLER.

(University of Illinois).

(1) See *Isis*, III, 446 ; IV, 107.

Henrik Harpestraeng
A Danish Salernitan

Very few names of mediaeval Danish medical men are left, and the lives, writings, and titles of these are completely unknown in nearly all cases, as are the dates of their births and deaths. Various notes taken from religious and medical manuscripts acquaint us with their existence. A small number of medical texts are, to be sure, available, but, since they are anonymous, further investigation will be necessary before their authorship can be determined.

Even the most prominent of these mediaeval authors, HENRIK HARPESTRAENG, is rather unknown. PONTOPPIDAN (Annales Ecclesiae Danicae I, 656) quotes his funeral inscription, which is said to have been in the cathedral at Roskilde, in this way : *Non. Apr. Obiit Magister Henricus Harpestraeng, huius ecclesiae canonicus, MCCXLIV, qui multiplices eleemosinas huic ecclesiae contulit, tam in morte quam in vita sua*; and from another source (HAMSFORT, Script. Rer. Dan. I, 288) we know that he died on the *IV Nonas Apriles*. The exact date of his death will therefore be April 2, 1244. On the year of his birth, however, it is possible to get only an indirect statement, which will be given later on. Two manuscripts (old royal collection (G. K. S.) 3659. 8°) of the Royal Library of Copenhagen and Codex Grensholmensis (vid. KLEMMING : *Läke och örteböcker*, p. 499) date from the XVth century and state : « This is the medicament, which HENDRIK HARPESTRAENG gave to King ERIC ». This king (1241-1250) was the son of WALDEMAR the Victorious and BERENGARIA, and these citations contain the only items we have on the learned canon and doctor.

His works are to be divided into (1), astrological and prognostical papers, among which are found some indications for venesection, written for King ERIC; (2), herbals; (3), hygienic, diagnostic and surgical papers; and (4), a manual of treatment, arranged *a capite ad calcem* (which seems with great probability to be attribu-

table to HARPESTRAENG). All these texts exist only in Scandinavian languages, six of them in Danish, one in Norwegian dialect, four in Icelandic, and nine in the Swedish tongue, but further information about them will not be given here, as all these questions are amply treated in the excellent work of Mr. M. KRISTENSEN, which will be mentioned below.

It is no wonder that the mediaeval author of so great a literary production has been studied for years. The first edition was made by C. MOLBECH (1826). Though the title was HENRIK HARPESTRAENGS Danske Laegebog, the edition contained no manual of treatment, but simply one of the herbals, a book of stones, and a cookery-book. Modern critical researches have shown that these two last ones were written by another, unknown author. The Norwegian text is edited by M. HAEGSTAD (Christiania Vid. Selsk. Skr. 1906. Hist. filos. klass n° 2) under the title : « Et gammal-norsk Fragment av. H. H. ». Some of the Icelandic texts have a very skillful editor in H. KAALUND. (Köbenhavns Vid. Selsk. Skr. 6 R. Hist. filos. Afd. VI, 4 Alfraedi islenzk, I, 1908). To these Icelandic texts one more is to be added. It was lately found in Dublin (Royal Irish Academy n° 23, D. 3), is in 4° and written at the beginning of the xvth century. It is still unedited, but an edition is in preparation. The Swedish texts were reviewed by G. E. KLEMMING in his remarkable work : *Läke-och Orteböcker från Sveriges Medeltid*, Stockholm, 1883-1886.

A new period in the HARPESTRAENG investigations commenced with the splendid edition, made by Dr. MARIUS KRISTENSEN, the title of which is : HARPESTRAENG. *Gamle Danske Urteböger, Stensböger og Kogeböger*, Köbenhavn, 1908. As will be seen, HARPESTRAENG's name is here used as a collective word, because the edition comprises not only those texts which with certainty may be attributed to him but also the old Danish stone-books and cookery-books. Dr. KRISTENSEN's book is remarkable because the modern philological method is for the first time applied, and ample information is given, not only about the different manuscripts, but also about their inner relations and about the place of HARPESTRAENG in the system of medical history. The edition is so elaborate that it satisfies all wants, but it has not yet been completed.

We have seen that HARPESTRAENG's manuscripts have until now been found only in Scandinavian libraries — with one single exception (Dublin). But the learned author might possibly be found outside these countries, if his Latin name were to be discovered. It would,

moreover, be a very curious thing if his works had been written only in Northern languages, without any Latin model or original form. Now the writer of these lines, J. W. S. JOHNSSON, has found in a manuscript in the royal library of Copenhagen (G. K. S. 1654. 4°) a couple of Salernitan texts, and, between them, one with the title *De simplicibus medicinis laxativis*, written by a certain HENRICUS DACUS. A comparison with the text of HARPESTRAENG made it evident that a Latin translation of the 81st chapter of the herbal had been found, and it was later on edited. (HENRICUS DACUS [HENRIK HARPESTRAENG] : *De simplicibus medicinis laxativis*, udgivet for förste Gang af J. W. S. JOHNSSON, Köbenhavn, 1914. French translation in *Janus*, 1917). The Latin name of HARPESTRAENG being thus found, one had new possibilities of learning more about his life in foreign manuscripts. And, really, he does not seem quite unknown abroad. The ms. fr. 1357, 2v° (XV s) of the imperial (now national) library in Paris contains SYMON DE PHARÈS : *Recueil des plus célèbres astrologues et de quelques hommes doctes*, in which a certain « maistre HENRY de Danemarche » is mentioned, and it is said there that he was a famous doctor in Orléans and a great astrologer who made many predictions. He is also said to have lived in that town during the reign of King PHILIPPE AUGUSTE (1165-1223) and, more exactly, in 1181. The identity of HENRICUS DACUS (HENRIK HARPESTRAENG) and HENRI de Danemarche is almost a certainty, because different facts substantiate it and because the city of Orléans was preferred in the Middle Ages by Danes who studied abroad. Since Danes were enrolled at foreign universities when they were about twenty years old, the year 1181 gives us indications from which the year of his birth may be approximated.

The Latin text mentioned has been discussed from different points of view. The editor of it believes it to be a part of an original model, which was later translated into the Scandinavian tongues. M. KRISTENSEN thinks it is a work from HARPESTRAENG's younger days. But whether it is one or the other, the text points towards Salerno and indicates, in different phrases, that we have before us the fragments of a lecture.

HARPESTRAENG was no original author. His book is built up from different sources, all Salernitan. The most prominent of these are MACER : *De viribus herbarum* and CONSTANTINUS AFRICANUS : *De gradibus liber* and *De chirurgia*. The Latin text is written over citations from AVICENNA, COPHO and SALADIN.

The HARPESTRAENG studies have not yet come to an end. A. CLÉMENT

and M. KRISTENSEN have written about a remarkable stone-name used in the stone-book. (*Et mærkeligt Stennavn hos H. H.*, *Danske Studier*, 1917) and P. HAUBERG has shown, by examining manucripts, also from later periods than the Middle Ages, that many fragments were yet to be found, which surely were to be ascribed to the learned canon and doctor. The paper has been included in the periodical just mentioned (Lidt om HENRIK HARPESTRAENG Laegebog), and it teaches us that HARPESTRAENG served as a model for several later medical works, especially those of CHRISTIAN PEDERSEN and HENRIK SMID.

(Copenhagen.)

J. W. S. JOHNSSON.

Note on the Fahrenheit scale

We propose in this note to re-examine the question, how FAHRENHEIT came to adopt the graduation of his thermometric scale and also to consider the question whether he held the zero on his scale to be an absolute zero.

The only publications due to GABRIEL DANIEL FAHRENHEIT are five short articles, in Latin, dated 1724, and published in the Philosophical Transactions of London (1).

In the first article he gives the boiling points and specific gravities of five liquids ; he says that water boils at 212°. Reference to his thermometers is made in the following passage :

I. « Moreover, the above experiments have not been made at the same time, hence the liquids would have been subject to different degrees of heat ; as, however, the (specific) gravity varies in a different manner and unequally, I calculate their gravity at 48 degrees (a place which on my thermometer is exactly half way between the lowest point of severest cold (*intensissimi frigoris*) as obtained by mixing water, ice, sal ammoniac or sea-salt, and the degree of heat found in the blood of a healthy person). »

In his second paper FAHRENHEIT says :

II. « I manufacture two kinds of thermometers, the one kind is filled with spirit of wine, the other with mercury. Their length varies according to the use to which they are put. But all have this in common, that they agree in the number of degrees and vary between fixed limits. The scale of the thermometers serving merely meteorological purposes, begins with 0° and stops at 96°. This scale rests upon the

(1) *Philos. trans. of London*, Vol. 33, for the years 1724 and 1725, London, 1726. First article page 1-3. Second article, p. 78-84. Third article, p. 114-118. Fourth article, p. 140-141. Fifth article, p. 179-180. These articles are republished in German translation in OSTWALD's *Klassiker der Exakten Wissenschaften* N°. 57, 1894.

determination of three fixed points which are determined as follows: The first lies at the lowest part or at the beginning of the scale, and is found by a mixture of ice, water and sal ammoniac or also sea-salt; if the thermometer is placed in this mixture, then the liquid falls to the point marked 0. This trial succeeds better in winter than in summer. The second point is obtained, when water and ice are mixed without the aforesaid salts; when the thermometer is dropped into this mixture, the liquid stays at the 32nd degree, and this point I call the point of initial freezing, for stagnant water is covered with a layer of ice when in winter the thermometer-liquid reaches this degree. The third point lies at the 96th degree; and the spirit expands thereto when the thermometer is placed in the mouth or under the arm-pit of a healthy person and is kept there long enough to fully reach the temperature of the body... The scales of thermometers to be used in determining the boiling points of liquids likewise begin with 0, but stop at 600 degrees, for at about that temperature the mercury (with which the thermometer is filled) begins to boil. »

FAHRENHEIT's only other reference to his thermometric scale is in his fifth paper:

III. « In my account of experiments on the boiling point of several liquids, I mentioned that at that time the boiling point of water was found to be 212°; later I recognized through various observations and experiments that this point is fixed for one and the same weight of the atmosphere, but that, for different weights of the atmosphere, it may vary either way ».

Deductions:

a). From quotation I it follows that the two fixed points chosen for the thermometers which FAHRENHEIT described in 1724 were those of the ice-water-salt mixture and of blood temperature, and that the interval between them was divided into 96 steps.

b). From quotation II we see that FAHRENHEIT (unlike other experimenters) had also a third point, determined by an ice-water mixture. We conjecture that this third point answered the purpose of more carefully comparing and checking the graduations of thermometers.

c). Quotations I, II, and III lead to the conclusion that the boiling point of water was not used by FAHRENHEIT as a fixed point in the graduation of the thermometers described in his papers, that, in designing the thermometers which he used in determining boiling points, the 96 degree scale, above referred

to, was extended by equal steps on the stem of the thermometer and that, after the graduation was thus completed, FAHRENHEIT found by experiment that the boiling point of water fell at 212°. The number 212 was, therefore, not pre-arranged; boiling water simply *happened* to raise the mercury column to that point. If our interpretation is correct, then it was equally a matter of chance that, in the thermometers described in 1724, 32° came to mark the freezing temperature of water and that 180 came to stand for the number of degrees between the freezing and boiling points of water. We would expect that in his later practice, FAHRENHEIT would profit by the results of his experimentation, that he would discard the two fixed points mentioned in quotation I and choose the freezing and boiling temperatures of water as more convenient fixed points. But we possess no direct and reliable information that either he or his Amsterdam partner, PRIUS, actually took this step.

Unless there are weightier reasons than mere guesses or conjectures (no matter how brilliant and tempting the conjectures may seem), it is not safe for a historian to depart widely from the obvious and direct consequences of statements made by an author. A violation of the rule has led to claims relating to the FAHRENHEIT scale that are most probably wrong.

For example, POGGENDORFF [1] mentions a writer who expressed the opinion that though FAHRENHEIT does not claim to have used the boiling point as a fixed point in the graduations described in 1724, he nevertheless actually did use it along with the freezing point of water. Guesses of this sort are hazardous.

Again, ROSENBERGER [2] states, without giving any facts to support him, that FAHRENHEIT fixed on his thermometer stem the salt-ice and the water-ice points; then divided that interval by continued bisection into 32 parts, that thereupon the continuation of those divisions, yielded 96 as the temperature of blood. This interpretation does violence to FAHRENHEIT's statement as given in Quotation I, and does not fit the description found in the *Acta Eruditorum* for the

---

[1] J. C. POGGENDORFF, *Geschichte der Physik*, Leipzig, 1879, p. 520.

[2] F. ROSENBERGER, *Geschichte der Physik*, Vol. II, Braunschweig, 1884, p. 281. J. C. FISCHER, *Geschichte der Physik*, Vol. III, Göttingen, 1802, p. 222.

year 1714, of two thermometers which FAHRENHEIT donated to CHRISTIAN WOLF. That description is in part as follows (1):

« The entire scale is divided into 26 equal parts, of which each is subdivided into fourths. Very great cold (*frigus vehementissimum*) is written at the second division from the cylinder, and from it ascending toward the end of the scale there are marked off 24 degrees, of which the fourth indicates great cold, the eighth cold, the twelfth moderate, the sixteenth hot, the twentieth very hot, the twenty-fourth unbearably hot (*aestum intolerabilem*). »

According to this account the interval from ice-water-salt to blood temperature was first subdivided by FAHRENHEIT into 24 parts, then each of these into four smaller quadrants, making 96 parts in all. This statement is confirmed by Professor CHRISTFRIED KIRCH of Berlin who in 1737 gave the following information (2):

1. My thermometer, which I have used several years, was made by the so skilful FAHRENHEIT more than twenty years ago. On it 24 degrees of heat are numbered ; 0 denotes the greatest cold and 24 the highest heat. Two more degrees are introduced below zero, so that the degree of cold of the thermometer can be reckoned even when, in the case of extraordinary cold, its fluid contracts so as to withdraw below the limit zero.

2. This is a thermometer of small or medium size ; its scale measures 5 Rhenish inches from 0 to the 24th degree. The single degrees are divided into four quadrants, so that from degree zero to the last division line there are 96 quadrants.

3. On the newer FAHRENHEIT thermometers the scale is no longer divided into 24 degrees and quadrants, but into 96 smaller degrees, corresponding to the 96 quadrants of the 24 degrees in which the older thermometers are divided.

4. Some years ago I noticed that my thermometer did not entirely agree with others of FAHRENHEIT, and so I ordered from the famous Mr. FAHRENHEIT a new and exact thermometer, so as to be able to compare with it my own and other thermometers. I found that this new thermometer agrees well with others of FAHRENHEIT, but differs noticeably from mine.

---

(1) *Acta Eruditorum*, Leipzig, 1714, p. 381.

(2) *Miscellanea Berolinensia*, T. VI, printed 1740. We take this quotation from W. J. FISHER's article « The Relation of RÖMER and FAHRENHEIT to the Thermometer » in *School Science and Mathematics*, Vol. 18, 1918. p. 648.

Thus both WOLF and KIRCH corroborate FAHRENHEIT's statement of the graduation of his thermometers.

As a third historical error, we refer to E. GERLAND's (1) claim that the 96 degrees of FAHRENHEIT's smaller thermometer is an adaptation of the scale in Florentine thermometers, which indicated 16° when the weather was coldest, and 80° when exposed to the summer sun. But the 16° were positive, hence the interval was 80°—16°, not 80°+16°. The quotations we made from WOLF and KIRCH show that with FAHRENHEIT the 96 was reached by the route of 4 times 24.

Fourthly, in the article « Thermometer » in the *Edinburgh Encyclopaedia* (Philadelphia, 1832), PETRUS VAN MUSSCHENBROEK (2) is quoted as authority for the statement that FAHRENHEIT placed the highest point of the scale at the boiling point of mercury and then divided the space between that and his zero into 600 equal parts. A similar statement is found in CHARLES HUTTON's *Mathematical and Philosophical Dictionary*, 1795. These claims are at variance with FAHRENHEIT's own statements regarding his primitive fixed points.

Fifthly, A. J. VON OETTINGEN (3) asserts that FAHRENHEIT was the first to construct mercury-in-glass thermometers, but such thermometers were made earlier by the Parisian astronomer ISMAËL BOULLIAU (1659) and by others.

Lastly, POGGENDORFF (4) speaks of « die Temperatur des vermeintlichen absoluten Nullpunkts von FAHRENHEIT ». Did FAHRENHEIT consider his zero absolute ? His reference in our quotation I, to a temperature *intensissimi frigoris* is not conclusive ; does he mean the most intense cold *actually attained* or *ever attainable* ? Most probably the first, for : (1) in his fifth paper FAHRENHEIT marks 96° on his scale « extream hott » and 0° « extream cold » ; he knew « extream hott » could be surpassed upward, hence, probably, he did not consider « extream cold » to be unsurpassable downward. (2) The *frigus vehementissimum* on the FAHRENHEIT thermometers described by WOLF lends no stronger support to POGGENDORFF's contention. (3) On the

---

(1) E. GERLAND *Geschichte per Physik*, München and Berlin, 1913, p. 620.

(2) P. VAN MUSSCHENBROEK, *Essai de Physique*, Leyden, 1739, § 948.

(3) OSTWALD's Klassiker n° 57, p. 126.

(4) POGGENDORFF, *Geschichte der Physik*, p. 519. That FAHRENHEIT considered his zero to be absolute is stated also in REES' *Cyclopaedia*, article « Thermometer » and in other publications.

contrary, according to WOLF and KIRCH, the thermometers made by FAHRENHEIT contained one or two of the large twenty-four-step scale divisions, that were placed below the zero point, thus allowing for temperatures just below the FAHRENHEIT zero.

FLORIAN CAJORI.

University of California, Berkeley, Calif.

Introduction to the History and Philosophy of Science

(Preliminary note)

Before leaving Belgium in October 1914, I had buried all my smaller notes in my garden. The rediscovery of these notes and of a good part of my library and of my larger notes, in August 1919, enabled me to resume at once the realization of an old design, namely, the writing of an introduction to the history and philosophy of science. Many months of the fall and winter of 1920 were almost entirely devoted to the reclassification of my material, and it was only on January 12, 1921 that I could begin the actual writing. I had at first thought that as soon as my material was duly classified, the writing would be relatively easy, for it is a fact that the Introduction exists potentially in my notes. Yet I discovered once more that there is a long, long way from such potentiality to reality. I am now publishing this preliminary paper because : 1. I realize that more time may elapse before the appearance of the Introduction than I had at first reckoned ; 2. To ensure greater completeness and accuracy I propose to submit parts of my work as soon as they are ready, to various specialists : this note will explain my purpose to them more fully than I could do it in a letter.

This preliminary note is divided as follows : (I) Purpose ; (II) Plan; (III) Tentative Table of Contents ; (IV) Method.

I. — Purpose.

The fundamental purpose is to establish the history of science as an independent and organized discipline. The lack of organization of these studies is but too painfully obvious. The number of men professionally engaged in them is so small that it can be counted on both hands, and most of them are concentrating their attention upon a particular science or group of sciences. There are no textbooks above the elementary grade and hardly any of the intellectual tools without which research is necessarily very slow. The greatest number of scientists and scholars have not yet understood, — I do not say the importance of these studies, but their mere possibility ; they have

not yet admitted their very right to exist. Even when courses on the history of science have been organized in a few of our universities or colleges, the very way in which this has been done, suggests an utter misunderstanding of the question. A university president who would invite a professor of botany to teach Greek history would, of course, make a fool of himself, but nobody laughs when he asks the same professor to extemporize a course on the history of science. Yet the latter undertaking, in the absence of the proper tools, is one of great risk and difficulty, while the existence of many excellent textbooks (each being the result of a long, progressive evolution) makes it relatively easy to prepare a course on Greek history. I do not hesitate to say that albeit I have devoted the best part of my life to the study of the history of science, I would find it much easier to give an accurate (if not original) account of Greek political history, than of the development of science. In the first case indeed, I could at once take full advantage of the labour and of the accumulated experience of hundreds of scholars, in the latter case, on the contrary, I would be largely thrown upon my own resources.

Among the scientists and scholars who have become sufficiently interested in our studies, very few seem to have appreciated their special difficulties, which arise from their involving at every step a sound knowledge of two distinct sets of facts : scientific facts and historical facts, and a sufficient familiarity with the methods required to ascertain and interpret these two kinds of facts. The method of the history of science is a combination of the scientific and historical methods. Scientists are apt to underestimate the mere historical difficulties ; historians, to misunderstand the scientific data.

To establish the history of science as an independent discipline, our first step must be to define these studies, to explain carefully the knowledge they imply, the methods which must be used to promote them and finally to take stock of what has already been done and draw attention to that which remains to be done. My Introduction will be such a preliminary survey. It will contain also a summary of the history of science in general and of the history of each science in particular. It will deal chiefly with the development of pure sciences and only subsidiarily with their applications ; for one thing, the number of fundamental principles is limited while the number of applications is unlimited, and we must keep within reasonable bounds. Hence all the most important scientists will be included in the survey, while most educators, administrators, physicians, engi-

neers, inventors will of necessity be neglected. The most important scientists in our eye are those whose discoveries were more original and fundamental, and oriented scientific thought in a new way or enlarged its horizon. It is of course impossible to make a selection upon which all will agree, but I am taking great pains to realize as objective and comprehensive a choice as possible.

The history of science is not simply important in itself, as the history of one of the highest of human activities, but even more because it is the natural basis of the philosophy of science, and indeed of any positive philosophy. To be familiar with the latest stage of knowledge is insufficient for all but merely technical aims : it is impossible to appreciate the pregnancy of that knowledge unless we know its evolution, and unless we be able to place it in its proper historical as well as in its proper scientific background. From that point of view, it is clear that the history of science is even more significant than the history of religion or the history of art, which have long enjoyed full recognition as separate branches of learning and have reached a high degree of organization. For as soon as we realize that our knowledge of nature and of man can not be complete unless we combine historical with scientific information, the history of science becomes, so to say, the keystone of the whole structure. But it is safe to add that the number of scientists and historians who have fully realized that, is exceedingly small.

The aim of the Introduction is to give a complete proof of these assertions, to make a preliminary survey, to provide the student with a synthetic bibliography of the whole field and a master key to its problems.

II. — Plan.

The Introduction is divided into two main parts, of which the first is devoted to the History and Philosophy of Science as a whole, the second to the History and Philosophy of the special sciences and of their branches.

The First Part in its turn is divided into three main sections : the first deals with generalities ; the second is a survey of the work accomplished at certain epochs or by certain racial or religious provinces of humanity ; the third, a survey of scientific progress, century by century.

The Table of Contents quoted below gives all the information that is needed on the first section. Neither does the second section call for much explanation. Its various chapters are devoted each to one

of the great periods of history (prehistoric times, antiquity, Babylonia, Egypt, Middle Ages) or to one of the great groups of men (primitives, Chinese, Mohammedans, etc.,) whose activity requires independent study, either for philological or for other reasons. For each of these chapters I will try not simply to give the synthetic bibliography but also to explain the specific methodology of the subject. It is plain that one can not undertake a study of, say, Mediaeval or Chinese science without undergoing a certain preparation and becoming acquainted with new methods and points of view. Of course these chapters are written primarily for the historian of science. The one dealing with Islamic science, for example, is not written for the Arabic scholar, and I will assume that the reader either knows the Arabic language or does not wish to know it. Yet it is hoped that the average Arabic scholar, not specially familiar with science, will find in it a sufficient amount of fresh information, and possibly the suggestion of a new point of view. The same remarks would equally apply to the other chapters.

In the third section, by far the most extensive, I survey the development of science century by century. For each century, I first quote the main sources relating to the progress of every science and of science in general, then, taking one by one its main scientists, I give a brief account of their life and work, and name the best editions of their writings and the best biographies and commentaries. The selection will be of necessity more rigorous for the later centuries and especially for the XIXth century because of the increasing abundance of discoveries. Scientists still living will be included if their main work was done before 1901. Down to the year 1501, all the main scientists of any real importance are included, but beginning with the sixteenth century, I consider only those whose activity was not largely restricted to one special science, the others being dealt with in Part II when I speak of the particular science which they cultivated. For example, PASCAL, NEWTON, GAUSS are considered in Part I, while COPERNICUS, VESALIUS, VIÈTE, HARVEY, ABEL will appear only in Part II. However, cross-references will enable the reader to survey with comparative ease, either the total progress accomplished in each century or the continuous development of each science throughout the ages.

The Second Part contains an introduction in which the great problem of the Classification of Sciences is studied under its historical and philosophic aspects, and then as many main sections as

there are main groups of sciences. I consider seven groups, but I do not attach much importance to this classification and it is quite possible that the editing of my notes will oblige me to change it. While the first part is of greater interest to historians, the second will probably appeal more strongly to scientists and philosophers. The Table of Contents gives its main divisions, and the subdivisions of one of its chapters.

III. — Tentative Table of Contents.

FIRST PART.

The History and Philosophy of Science.

(A) Introduction :

1. Definition of Science. Its signification and limitations.
2. History of Science : definition; aim and signification; sources; methods; history of these studies; their relation to other studies; main sources of auxiliary studies.
3. Organization of Science : external, technical, internal. (cfr. *Isis*, I, 195). National and international organization.
4. Philosophy of Science.

(B) Development of Science at certain periods or by certain peoples.

1. Introduction.
2. Prehistoric times.
3. Antiquity.
4. Egypt.
5. Babylonia and Assyria.
6. Old Testament Civilization.
7. Greece.
8. Rome.
9. Byzantium.
10. Middle Ages.
11. Asia.
12. China.
13. India.
14. Japan.
15. Iran.
16. Islam.
17. Israel.
18. Primitive and popular Science.

(C) Development of Science, century by century.

1. Ninth century B. C.
2. Eighth century B. C.

. . . . . .

9. First century B. C.
10. First century.

. . . . . .

14. Fifth century.
15. Sixth century.

. . . . . .

. . . . . .

25. (1) Sixteenth century.
26. Seventeenth century.
27. Eighteenth century.
28. Nineteenth century.

(1) From the xvith century on, only general scientists are considered, but the special scientists dealt with in the Second Part are quoted.

SECOND PART

History and Philosophy of the particular Sciences.

(The subdivision of this second part is not yet entirely determined. The following order is given tentatively.)

Introduction, Classification of the sciences : History and discussion of the attempts to classify the sciences. Vanity but practical necessity of such efforts. The applied sciences are not disconnected from the pure sciences, but, as much as possible, the principles and applications of science are considered successively in the same chapter. However, applications based upon the principles of many sciences are dealt with separately (*ex. gr.* technology, medical sciences).

(A) Formal sciences (Knowledge of forms) :

1. Logic and Theory of Knowledge.
2. Mathematics (including the statistical method).

(B) Physical sciences (Knowledge of inorganic nature) :

1. Mechanics.
2. Astronomy.
3. Physics.
4. Chemistry.
5. Technology.

(C) Biological sciences (Knowledge of organic nature) :

1. Botany.
2. Zoölogy.
3. Anatomy.
4. Physiology.
5. Biology.

(D) Sciences of the Earth (implying a knowledge of both inorganic and organic nature) :

1. Geodesy.
2. Geography and oceanography.
3. Geology, mineralogy, palaeontology.
4. Meteorology and terrestrial physics.

(Nos. 1 and 4 might have been placed in group B; they have been placed here for the sake of completing group D.)

(E) Anthropological and historical sciences (Knowledge of man, past and present) :

1. Physical anthropology.
2. Psychology.

3. Archaeology.
4. Ethnology.
5. Sociology, jurisprudence and positive polity.
6. Economics.
7. History of civilization.
8. History of art.
9. History of language and literature.
10. History of morals.
11. History of religion.
12. History of superstition and occultism.

(In nos. 7 to 12, the word « history » has about the same sense as in the phrase « natural history ». It might be replaced by the word « science ».)

(F) Medical sciences :

1. Medicine (to be subdivided in many separate sections).
2. Pharmacy.

(G) Educational sciences (the methods of imparting and diffusing knowledge) :

1. Pedagogics.
2. Bibliography. Library science.
3. Museology.

(H) Philosophical sciences.

It would be too long to give the contents of each section of this Second Part. I will simply outline one of them, which may be taken as representative.

Mathematics.

(A) Introduction :

1. Definition of mathematics. Its relations to the other sciences and its main subdivisions.
2. History of mathematics. Its main sources and its history.
3. Organization of mathematics (*ex. gr.* : bibliography, encyclopaedias, main textbooks, institutes, teaching, congresses, national and international organizations).
4. Philosophy of mathematics.

(B) History of mathematics century by century.

1. For the early times down to the fifteenth century (incl.) this historical outline will be very brief and will consist chiefly in references to the paragraphs of the First Part dealing with mathematics and mathematicians.

2. The sixteenth century.
3. The seventeenth century.
4. The eighteenth century.
5. The nineteenth century.

(C) History of special branches or topics.

1. History of various branches and sub-branches, with critical bibliography of the main publications relative to each. For example : Arithmetic; Algebra; Geometry (elementary, analytical, descriptive, synthetic); Trigonometry, etc. Theory of groups, Theory of Numbers, Determinants, Combinatorial Analysis, Theory of Equations, Theory of Probabilities, Statistical methods, etc.
2. History of particular topics : Quadrature of the circle, special curves, imaginary elements, mathematical instruments and models, etc.

CONCLUSION

(A) The History of Science, an essential part of education.

(B) The Encyclopaedic point of view.
History of encyclopaedic endeavours.

(C) The New Humanism.
History of humanism. Reconciliation of the humanistic and the scientific attitudes. The New Humanism.

Indexes.

IV. — Method.

The main substance of the introduction is directly derived from the enormous amount of notes which, being driven by an insatiable curiosity, I have managed to take on practically every topic having any relation, however remote, with the history of science. Unfortunately many of these notes were written when I was still very immature and are, in their present form, of little value. Besides, before the war I had no access to as good a library as the one in which I am now privileged to work. Hence many of my pre-war notes, being either immature or second-hand, have to be corrected, completed, rewritten. However, they are very useful to me as finger posts, and my work would be less comprehensive without them.

The information derived from my own collections is completed by the systematic use of three other sources : in the first place, the

Widener library, whose treasures are as accessible to me as if they were my own and whose catalogue is almost perfect; in the second place, a few standard textbooks dealing with the history of particular sciences. However, this second source is distinctly of an auxiliary nature. I use it only to make sure that no item of any importance has been neglected. The total amount of the Widener collections and of mine is so great that the probability of my overlooking any important scientist is very small; moreover the amount of information I have on each of them — obtained so to say at random during many years of study — enables me to measure their relative importance in an objective way, (that being of course only a first approximation.)

Finally I propose to submit various chapters or paragraphs of the Introduction, as soon as they are completed, to experts and to ask for their criticism and advice : this will be my third source.

It will be noted that the simultaneous use of my own collections and of these three other sources must give to my selections a good deal of objective value. This is especially important in the present case, for the size of the subject naturally obliges me not simply to select the topics to be considered, but even for each topic, to select the information to be given. The bibliography to be truly synthetic (see *Isis* III, 159-170) must be critical and selective. I will eliminate the dead wood as much as I can and add critical appreciations as often as possible.

Neither will I hesitate to introduce eventually reflexions of a more personal vein. I will do this for I know by experience how such side remarks can be helpful sometimes even if they be a little adventurous : how often have I not wished that authors whom I was consulting had been less reticent! This can not jeopardize the objectivity of my work for the reader will always know when I am stating a fact and when I am simply expressing an opinion.

It is hardly necessary to add, that however much I may try, the various chapters or paragraphs of such a book are bound to be of very unequal value. I may spend so much time investigating the material pertinent to some of them, that the writing of a new monograph on the subject would cost me but little additional pains. For many others, I must needs rest satisfied with a far more superficial investigation, or else my Introduction would never be ready.

GEORGE SARTON.

(Cambridge, Massachusetts. May 23, 1921.)

The Principle of Symmetry

and

its applications to Science and to Art [1]

It is part of the purpose of *Isis* to draw the attention upon the process of organization or reorganization which science is constantly undergoing and which causes any attempt at classification of its branches to be extremely precarious. A reorganization may become necessary almost at any time, either by the discovery of a new cardinal fact, or by the introduction of a new fundamental method or by the extension of an old method to a larger field. F. M. JAEGER is professor of inorganic and physical chemistry at the University of Groningen and has made a special study of crystallography. His « Lectures on the Principle of Symmetry » are a good example of synthesis of the third kind, that is, resulting from the extension of an old method to new objects. He has thought wisely that the theory of symmetry which had proved to be such a powerful instrument of knowledge in a relatively small field should be systematically applied to the other branches of science. The results of his investigations are very encouraging and there is no doubt that it will be worth while to follow his trail.

But before examining his work, I must make another remark. The theory of symmetry is of special interest from our point of view because it carries us at once into the borderland between science and philosophy, and also between science and art; — if I may say so, into the very home of *Isis!* — By the way, it would be fascinating to retrace the development of the idea of symmetry from the Pytha-

---

(1) A propos of F. M. JAEGER's Lectures on the Principle of Symmetry and its applications in all natural sciences, XII + 333 p. Amsterdam, ELSEVIER; Cambridge University Press, 1917 (A second improved and augmented edition, XII + 348 p. has appeared in 1920) and subsidiarily of other publications by D'ARCY WENTWORTH THOMPSON, Sir THEODORE ANDREA COOK, JAY HAMBIDGE, DENMAN W. ROSS. My quotations have been made from the second edition of JAEGER's book.

gorean days down to our time. Such a study would enable us to make a master section through the whole history of scientific thought and would provide us with an excellent touchstone to appreciate the relations of science and art at various times. This examination would be very comprehensive, for it would take us into almost every department of knowledge; it would attract us into the workshops of the craftsmen as well as into the laboratories of the scientists; it would oblige us even to make a pleasant excursion in the realm of Chinese philosophy and aesthetics. Professor JAEGER himself might be tempted to carry on these investigations, and he would be doubly well prepared to undertake them (1).

To come back to his Lectures, he has not tried to give us a complete account of the mathematical theory of symmetrical systems, as this has been done often enough, but he has simply summed up the main results of this theory, to refresh the reader's memory. After a brief introduction in which he proposes to call symmetrical, figures « such as are similar to themselves or to their mirror-images in more than one way », he devotes the four first lectures to a brief account of the general theory, applying it already as often as he can, to organic morphology. For example (p. 69-71) he shows how the biologist could avail himself of the principle of symmetry for the description of plants and of animals. HAECKEL tried to use this method in his *Systematische Phylogenie*, 1894, but failed partly because this theory was not sufficiently developed, partly because of his own ignorance. Chapters V, VI, VII deal chiefly with the more special theory of symmetry as applied to crystals, but incidentally with many other applications. For example in chapter V he answers the query : How is it possible to speak of the specific symmetry of a physical phenomenon, of a physical state, or of a physical medium ? Then apropos of the symmetry of cause and effect he reaches the very interesting conclusion (p. 95) : « the effects may have occasionally the same or a higher symmetry than the producing causes, but the last cannot have a higher symmetry than the effects observed ». In chapter VI, JAEGER considers the case of unlimited systems and discusses the various theories concerning the constitution of crystals, taking into account the new facts revealed by the use of RÖNTGEN-rays. He ends this chapter by examining similar periodical arrangements

(1) For his studies on the history of chemistry, see *Isis*, IV, p. 50, 83.

in living nature, — in particular, phyllotaxis. Then, comparing periodical arrangements in crystals and in plants, he concludes (p. 170) : « The essential difference between the two cases remains this, that all kinds of net-planes can with a greater or smaller probability of occurrence, have the function of crystalfacets, while of all theoretically possible regular distributions of the loci of leaf-attachment in plants only those are realized by nature whose divergencies approach closely to those expressed by the fractions of the principal series, $^1/_2$, $^1/_3$, $^2/_5$, $^3/_8$, $^5/_{13}$, [the so-called series of FIBONACCI], or of series deduced from it in a simple way ». Chapter VII is devoted to a study of crystallographic aberrations — mimetic forms and apparent symmetry — and this enables the author to emphasize more strongly the contrast between organic and inorganic nature : (p. 202) « In living nature, there is a gradual evolution of forms from higher towards lower symmetry and a characteristic preference for the irrational ratio of the « aurea sectio »; in the inorganic world on the contrary, a tendency towards higher symmetry as to a condition of greater mechanical stability and the exclusion of all irrational ratios in the period of the symmetry-axes » (1). This contrast is very great but at the bottom it may be nothing but the obvious opposition between the tendency towards equilibrium (the growth of entropy) and the tendency towards ceaseless change, — or more briefly, the opposition between death and life. Indeed this contrast might be used to define life.

But we are not yet at the end of our study. Chapters VIII and IX

---

(1) It is well to substantiate this general statement with a few examples borrowed from JAEGER's book (p. 200) : (A). *Tendency towards a higher symmetry in the inorganic world.* (1) Apparent and mimetic symmetry in crystals ; (2) polymorphic substances generally changing into higher symmetrical forms when temperature increases ; (3) optical antipodes tending to pass into optically inactive systems ; (4) when several isomerides may occur simultaneously, preferential formation of the more symmetrically built molecules (for ex. it is far easier to produce the threefold symmetrically substituted derivatives of phenols, anilines, etc., than their less symmetrical isomerides). — (B). *Tendency towards a lower symmetry in the living world.* (1) Lower animals show in many cases a much higher symmetry than the mere bilateralism of the higher animals; (2) pelories, that is abnormal regularity of structure occurring in normally irregular flowers : this phenomenon is generally explained as a retrogression towards an older and more symmetrical prototype.

As to the characteristic preference for the irrational ratio of the golden section, it will suffice to recall the frequent occurrence in the living world of pentagonal symmetry, — a symmetry unknown in the inanimate world.

deal with PASTEUR's discovery of the relation between enantiomorphism and optical activity and with the consecutive development of stereochemistry. PASTEUR was convinced that the production of single optically active substances was the prerogative of life (1), and it is a fact that one has not yet been able to perform a total asymmetric synthesis directly (that is, without the presence of living organisms or of other asymmetric substances). JAEGER fully discusses this fundamental question, quoting and analysing all the relevant facts. The contrast between the living and the death world seems greater than ever : « The living world is *specific* in its dissymmetry and its dissymmetric specificity is of the highest nature ». This discussion is of course not new; as JAEGER recalls it (p. 301), a very interesting controversy on this very subject was started in 1898-1899 by JAPP's address to the British Association on « Stereochemistry and Vitalism ». E. FISCHER was the first to point out, in 1894, that the contrast between natural and artificial synthesis is not as absolute as PASTEUR believed it to be. Natural synthesis in the living organism takes place in a one-sided way, because it occurs under collaboration of optically active substances; moreover the one-sidedness may be due simply to the fact that natural synthesis can never lead to a state of completed chemical equilibrium, as the produced substances are gradually consumed by the organism; this one-sidedness is thus brought within the scope of chemical dynamics, being simply reduced to a difference in reaction velocities. If the one-sidedness of chemical reactions in living bodies is explained by the guiding influence of optically active substances, one must still explain how the first substance of this kind originated. A. BYK has tried to demonstrate that this original asymmetry in the living stuff was caused by a constant excess of circularly polarized light of a definite direction of rotation, but this seems to me a little adventurous (2).

* * *

(1) « Les produits artificiels n'ont donc aucune dissymétrie moléculaire ; et je ne saurais indiquer l'existence d'une séparation plus profonde entre les produits nés sous l'influence de la vie et tous les autres... Il y a là des mystères, qui préparent à l'avenir d'immenses travaux et appellent dès aujourd'hui les plus sérieuses méditations de la science. » L. PASTEUR, 1860 (as quoted by JAEGER, p. 284).

(2) PASTEUR himself devised ingenious experiments to establish the chemical importance of the asymmetry of natural forces, but failed (See VALLERY-RADOT, *La vie de* PASTEUR, end of Ch. III).

It is interesting to note that during the last years, many men — of very various types — have devoted much attention to the study of symmetry. Unfortunately when a subject is as broad as this one, and located at the crossroads of many theories, when its study has not yet been standardized, it always happens that a great deal of the energy of the first investigators is misdirected and actually wasted by their ignorance or their extravagance.

This remark does not apply to D'Arcy Wentworth Thompson's excellent book on « Growth and Form », Cambridge, 1917, (1) a very rich collection of facts cautiously selected and wisely classified. But it applies most decidedly to Sir Theodore Andrea Cook's extraordinary compilation, « The Curves of Life, being an account of spiral formations and their application to Growth in nature, to Science and to Art, with special reference to the Mss. of Leonardo da Vinci », London, 1914 (2). This book written by one of the most accomplished and learned dilettanti of our time, is a remarkable mixture of wisdom and eccentricity. It contains a very large collection of precious facts borrowed from the most heterogeneous sources, and the reader having enough knowledge and common sense to be protected against the fanciful theories of the author will find in it valuable material for his studies and much food for his thought.

The same remark applies also, I regret to say, to the very industrious and ingenious publications of Jay Hambidge. These have attracted so much attention, both in America and in England, that I must say a few words of them (3). This author is chiefly concerned with the application of symmetry to art and he claims to have discovered in the Greek monuments of the best period a method of design which may be of great use to the modern artist. He has introduced

---

(1) Cfr. *Isis*, III, p. 128-129.

(2) Cfr. *Isis*, III, p. 127.

(3) *Dynamic Symmetry*, 15 plates and text which explain some of the more obvious principles of the areas used in Greek design, Boston, Moosehorn Printing Co., 1919. — *Dynamic Symmetry, the Greek Vase*. 161 p. 4°, Yale University, 1920. — Jay Hambidge is the editor of *The Diagonal*, an illustrated monthly magazine devoted to the explanation of the rediscovered principles of Greek design, their appearance in nature, and their application to the needs of modern art. Vol. I, 1. Yale University, 1919 (no. 10 appeared in August 1920). I followed an interesting polemic on *Dynamic Symmetry* in the London Times, December 1919, January 1920; Jay Hambidge stated his case very well on the 6th of January.

the terms « static » and « dynamic » symmetry to express the contrast between the relatively simple sort of symmetry obtaining in the inorganic world and the more subtle and fleeting symmetry of the living forms. By the way this contrast had already been well shown in another way, by Sir THEODORE. The readers of JAEGER's book or simply of my review of it, will understand the deep significance of this contrast. The origin of beauty in nature or in art is to be found in the presence (conscious or not) of the irrational symmetry of life, and HAMBIDGE's practical purpose is to give to the artist some simple means to realize mechanically this type of symmetry. So far, so good. Unfortunately the results of his investigations are explained in a mysterious language, obscured by the use of bad geometry and of unnecessary technical terms. It is probable however that it is partly because his « discoveries » have been covered by an air of mystery and rendered artificially far more abstruse than they are, that they have been so successful. Such is the fascination which an appearance of mystery, pseudo-knowledge and muddled thinking always exert upon an ignorant public. To them a theory seems more profound when it is less clear. HAMBIDGE's discoveries could be explained briefly and clearly in very simple language to any person having a sound knowledge of elementary geometry. They would then be less mysterious and attractive but far more useful. Of course they will never provide recipes for the making of masterpieces (HAMBIDGE himself does not make such foolish claim) but they will give to the artist a method of design which, if it be simple enough (1), may be just as useful to him as, say, his knowledge of the principles of perspective. Or to use other comparisons, this method of design (or other methods similar to it (2), for we do not yet know which will triumph) may help the painter, the sculptor, the architect in the same way that the methods called harmony and counterpoint help the musician, or that the rules of prosody help the poet. All these methods, — that is, those systems of conventional rules, — are very useful even if they are not strictly abided by, for even when the artist chooses to stand at the outside he is still guided by them.

---

(1) HAMBIDGE's applications of a sound general principle are already much too complex and farfetched. Artistic methods to be fertile must be very simple, so as to interfere as little as possible with free inspiration.

(2) For ex. DENMAN W. ROSS' ideas as explained in : A Theory of Pure Design. Harmony, balance, rhythm. Boston, 1907.

To sum up, JAEGER's and THOMPSON's books are contributions of great value. They help us to understand more clearly one of the greatest riddles of the universe : the nature of life. Besides, JAEGER's book will help us to apply the Principle of Symmetry to other scientific problems. It would be interesting to conduct similar investigations from the artistic point of view, for the consideration of symmetry throws as much light on the nature of beauty as it does on the nature of life. The studies published by Sir THEODORE ANDREA COOK and by JAY HAMBIDGE are certainly not lacking in originality and they are very suggestive, but on the whole disappointing. We feel cheated; the vision which these books suggested was so great, — and so little is left of it! Yet, this is only a beginning, and at any rate all these books help us to appreciate the fundamental importance of Symmetry, which has always been and will always remain one of the safest guides both of the scientist and of the artist.

GEORGE SARTON.

Notes and Correspondence

Encyclopédie des Sciences mathématiques pures et appliquées. — J'ai déjà protesté avant la guerre (1) contre la lenteur de publication de cette encyclopédie. Cette lenteur était vraiment excessive et témoignait d'un joli mépris des intérêts des souscripteurs. La publication a été entièrement interrompue pendant la guerre et après plus de deux ans de « paix » elle ne donne encore aucun signe de vie. En attendant, les malheureux souscripteurs (dont je suis, hélas!) se trouvent en possession de 32 fascicules — *disjecta membra* — qui sont les commencements de non moins de 17 volumes dont *aucun* n'est complet! Pour préciser ma critique je donne ci-dessous brièvement la liste des volumes entamés; on remarquera d'abord que les 4 premiers auraient pu être complétés assez rapidement, ce qui aggrave la faute des directeurs et des éditeurs; ensuite que la publication d'avant-guerre était déjà scandaleusement lente puisque le premier fascicule date de 1904! Voici la liste :

I, 1.	Arithmétique	4 fascicules,	1904-1909.
I, 2.	Algèbre	id.	1907-1912.
I, 3.	Théorie des nombres	id.	1906-1910.
I, 4.	Calcul des probabilités.	id.	1906-1911.
II, 1.	Fonctions de variables réelles . . .	2 fascicules,	1909-1912.
II, 2.	Fonctions de variables complexes . .	1 fascicule,	1911.
II, 3.	Equations différentielles ordinaires .	id.	1910.
II, 4.	Équations aux dérivées partielles. .	id.	1913.
II, 5.	Développements en série	2 fascicules,	1912-1914.
II, 6.	Calcul des variations	1 fascicule,	1913.
III, 1.	Fondements de la géométrie	id.	1911.
III, 2.	Géométrie projective	id.	1913.
III, 3.	Géométrie algébrique plane	id.	1911.
IV, 1.	Mécanique générale.	id.	1912.
IV, 5.	Systèmes déformables	2 fascicules,	1912-1914.
IV, 6.	Balistique, hydraulique	1 fascicule,	1913.
VII, 1.	Astronomie sphérique	id.	1913.

Ces fascicules contiennent évidemment des matériaux précieux et

(1) *Isis*, I, 256, 1913.

nombreux, mais tels quels, il est très malaisé de les utiliser, car aucun volume n'étant complet il est impossible de les faire relier. De plus quand il sera complet, chaque volume sera extrêmement hétérogène. car si récents que soient les derniers chapitres, les premiers seront déjà vieux de vingt ans. Espérons que tous ceux qui sont responsables s'efforceront de réparer ce gâchis aussi vite que possible. Il compromet sérieusement la bonne renommée des éditeurs scientifiques français. G. SARTON.

Philip Lee Phillips' contributions to the bibliography of cartography. — Mr. PHILLIPS is not simply the chief of the Division of Maps of the Library of Congress in Washington, but its father, for he it is who organized it from chaos to its present condition of almost perfect order and availability. The map collection of the Library of Congress is certainly one of the richest (if not the richest?) in existence, and thanks to the untiring industry of its chief, it is probably the best classified and the best equipped to be found anywhere. On the basis of the immense amount of material systematically arranged by him, Mr. PHILLIPS has published a series of bibliographies which are by far the most extensive and the more elaborate of their kind. It is to him that the student of cartography owes his fundamental bibliographic tools. However Mr. PHILLIPS' activity and his publications have not yet received the full recognition they deserve and the purpose of my note is to try to make up, as far as it is in my power, for this injustice and to express publicly to him the gratitude and respect which any historian of science who knows his work, can but feel. It is easy enough to accomplish this purpose, for it will suffice to describe Mr. PHILLIPS' main publications; any but a very brief commentary would be superfluous. I will be able at the same time to give the reader some idea of the wealth of material — some of it, exceedingly precious — which is now available in Washington (1).

Let us consider, in the first place, the most important of Mr. PHILLIPS' publications, that is, his monumental *List of geographical atlases in the Library of Congress with bibliographical notes*, 4 vol. Washington 1909-1920, about 3642 p. (Vol. I and II, 1909 form a whole; vol. III and IV are supplementary lists published respectively in 1914 and 1920.

(1) I extract the following data from the latest *Report of the Librarian of Congress*. Washington, 1920, p. 60. The Library at the date of June 30, 1920 contained: 158,369 maps, 5,448 atlases, 969 manuscripts, 1,662 views, that is 166,448 items, *not* counting the SANBORN insurance maps, the British Ordnance survey maps and the Egyptian survey maps, 302,662 in number.

The author list of vol. IV includes references to the 4 volumes, but the reader should consult 3 indexes, in vol. II, III and IV. These 3 indexes contain about 87,300 entries.) These volumes contain the titles of 5,324 atlases. « The arrangement starts with general atlases of special subjects, followed by general atlases of the world arranged chronologically. Following, come America, Europe, Asia, Africa and Oceanica. Included in the collection are the atlases of cities, those to accompany voyages of circumnavigation, historical works, scientific explorations and reproductions in atlases to accompany boundary disputes between nations ». The compilation of such a list is especially useful because a great number of the separate maps contained in the map collections are simply maps which have been « detached » from atlases, and which can only be identified with reference to their source. This is the more difficult that the maps show no indications of their origin on their face. On the other hand, old atlases frequently contain maps of various provenances which have been « inserted » by some former owner. It must be noted that old atlases rarely contain tables of contents and are rarely dated. Sometimes the date of dated maps has been erased by unscrupulous publishers that they may be sold again as new ones. For these reasons, Mr. PHILLIPS has taken considerable pains to make sure that the old atlases examined by him were complete, and he has given us complete descriptions of them, map by map. Historians will be glad to find in this list also elaborate descriptions of the collections of old manuscript or printed maps published by SANTAREM, JOMARD, FISCHER, MÜLLER, NORDENSKIÖLD and others. This is the more valuable that these collections of fac-similes are rare and expensive and that but few people have easy access to every one of them.

Among the atlases analyzed in this work one will find *ex. gr.* : 42 editions of PTOLEMY, of which 32 are previous to 1600; 62 editions of ABRAHAM ORTELIUS; 30 of MERCATOR; Sir ROBERT DUDLEY, *Dell' arcano del mare... libri sei*, 3 vol, in-2. Firenze, 1646-1647, the first marine atlas in which the maps were drawn on the MERCATOR projection (minutely described in vol. I, p. 203-217), also second ed., Firenze, 1661; CORNEILLE WYTFLIET, *Descriptionis Ptolemaicae augmentum*. Louvain, 1597 and 4 later editions, the earliest distinctively American atlas; JEDIDIAH MORSE, *American geography*. London 1794, containing the earliest maps of the states in the union; CHRISTOPHER SAXTON, *Maps of England and Wales*. London, 1574-1579, later ed. 1659-1689, the so-called Elizabethan atlas, the earliest survey maps of England and Wales; ANTOINE LAFRÉRY, *Geografia*. Roma, 1575 (?), described with copious bibliographical notes in vol. III, p. 81-92, also p. IV; WILLEM JANSZOON BLAEU (1571-1638), *Flambeau de la navigation*,

Amsterdam, 1620, English ed., 1622; JOAN BLAEU (1596-1673), 12 atlases, chiefly his *Atlas Major*, 11 vol., Amsterdam, 1662-1665, containing 590 maps; the Library of Congress has another copy, partly of the same ed. dated 1662-1672, and also a copy of a Spanish ed. published in Amsterdam in 10 vol., 1659-1672. This Spanish ed. is very rare, as it was almost entirely destroyed by fire in 1672 (vol. III, p. 146-164; IV, p. 132-134); WILL. JANSZOON and JOAN BLAEU, *Théâtre du monde*, Amsterdam, 1635, and 5 other editions; HENRICUS HONDIUS and JAN JANSSON, *Nouveau théâtre du monde*. Amsterdam, 1639-1640; JAN JANSSON (d. 1666), 11 other atlases; WILLIAM BERRY. A collection of 38 maps of the world, sometimes called the English SANSON atlas, London, 1680-1689 (only two other copies of this atlas are known); NICOLAS SANSON d'Abbeville (1600-1667). *Atlas nouveau*, 1689-1690, and 2 other editions, also 13 editions of other atlases; JOHANNES CÓVENS and CORNELIS MORTIER, *Atlas nouveau*, 9 vol. Amsterdam, 1683-1761, a magnificent set of 922 maps (vol. III, p. 192-223) and 5 other atlases, etc. The 1525 maps, plans and views contained in PIETER VAN DER AA, *La galerie agréable du monde*, 66 vol. Leide, 1729 are enumerated and indexed (vol. III, p. 288-324).

I must quote more briefly Mr. PHILLIPS' other publications, however important: *Maps of Alaska*, 1588-1898, 119 p., 1898; *A list of maps of America*, in the Library of Congress preceded by a list of works relating to cartography, 1137 p., 1901. [The bibliography of cartography covers 90 p.; Mr. PHILLIPS writes me that a new edition of this bibliography is ready in manuscript. This new work is arranged in dictionary form and includes 28,440 titles (1)]; *Maps of Cuba*, 61 p., 1898; *Foreign Government Maps*, 58 p., 1904; JUSTIN WINSOR, *The* KOHL *collection* (now in the Library of Congress) of maps relating to America, with index by P. L. PHILLIPS, 189 p., 1904; *The* LOWERY *collection*, descriptive list of maps of the Spanish possessions within the present limits of the United States, 1502-1820, by WOODBURY LOWERY. Ed. with notes by P. L. PHILLIPS; *Maps of Philippine Islands*, 1903; *Maps and views of Washington and District of Columbia*, 1900 (revised ed. ready in Ms.); *Notes on the cataloging, care and classification of maps and atlases...*, 20 p., 1915; *Maps of the world war*, 202 p, 1918. (All of the previously quoted publications are published by the Library of Congress and may be purchased at nominal prices from the Superintendent of Public Documents at Washington D. C.).

The following fac-simile editions are published by LOWDERMILK & Co., Washington D. C.: *Map of Virginia and Maryland*, by AUGUSTINE

(1) See: *Report of the Librarian of Congress for 1919-1920*. Washington, 1920, p. 61.

HERRMAN, 1673 (from the unique copy in the British Museum); JOHN FILSON'S *Map of Kentucke*, the first map of Kentucky, 1784; JOHN FITCH'S *Map of the Northwest*, 1785; MANASSEH CUTLER'S *Map and Description of Ohio*, 1787.

Mr. PHILLIPS has published himself a book of halftone reproductions of rare views with notes, entitled : *The beginnings of Washington* as described in books, maps and views, and he has completed in manuscript various other compilations : *Maps of California and San Francisco to 1865; Maps and views of New York; Maps and views of Philadelphia;* BERNARD ROMANS, his biography and bibliography with a reproduction of the « Two whole sheet maps » of Florida, 1775; *The first map and description of Tennessee*, by General DANIEL SMITH [1795?].

It is very desirable that the still unpublished lists of Mr. PHILLIPS may be published as soon as possible, for they are of great importance. Of course, it is to be hoped that sooner or later his purely bibliographical descriptions will be supplemented by others based on a deeper study and comparison of this enormous mass of material, — that is, that Mr. PHILLIPS' *analytic bibliographies* will be completed by *synthetic bibliographies* (*Isis*, III, 159-170), in which the essential be put in the limelight and the superfluous, dropped, — but even when such indispensable synthesis be perfected, Mr. PHILLIPS' compilations will still retain their fundamental value. G. SARTON.

Hans Peder Steensby (1875-1920). — HANS PEDER STEENSBY was born on the 25th of March, 1875, in a little town, Steensby, on the island of Fyn, Denmark. His father was a farmer named JENS HANSEN. Because he was born in poor circumstances, he received aid from different people in the town who thus enabled him to go to the university of Copenhagen. He there passed his examen as candidatus magisterii in 1900. He studied from 1904 to 1906 at the Berlin university, taking his degree as Doctor of Philosophy in 1905 with a very remarkable book *Om Eskimokulturens Oprindelse*, 1905 (On the origin of the Eskimo-culture). This book was later on much discussed because it in different places advanced quite new points of view. STEENSBY then took up the study of Danish anthropology, and set forth his results in *Forelöbige Betragtninger over Danmarks Raceantropologi. Meddelelser om Danmarks Antropologi*, 1907 (Preliminary considerations on the anthropology of races in Denmark). Following ethnographical pursuits he travelled in 1908 in Algeria and Tunis (see *Geografisk Tidsskrift*, 1908-1910), in 1909 to West Greenland and Cape York, and in 1910 through Egypt, British Soudan and parts of Palestine and Arabia. His explorations in Greenland having given great results, he edited *Etnografiske og antropogeografiske Rejsestudier i Nord-Grön-*

land 1909. Meddelelser om Grönland, I, 1912. (Ethnographical and anthropo-geographical studies on a voyage in Nord-Greenland) and later an *Anthropo-geographical study of the origin of Eskimo Culture*, 1916 (*Meddelelser om Grönland*, LIII).

In 1911 he was named professor of geography at the university of Copenhagen, a few years after which the geographical instruction was completely reorganized, when he started a laboratory which included a great library for the students, and a museum. He then took up the study of geography on a historical basis, showed in a very elaborate paper that PYTHEAS of Massilia had travelled along the westcoast of Jutland and had given a description of it (*Geografisk Tidsskrift*, 1916), and explained in *The Norsemen's route from Greenland to Wineland*, Copenhagen 1918, what was meant by the different geographical terms used by the ancient saga-writers, and in what way they had gone to America. This book was for European geographers an event, for it undoubtedly gave the solution to a much discussed problem. The one thing lacking was a practical confirmation of his theories; he therefore in 1920 went to America, traversed it from South to North, and visited Wineland. On a postal-card which I received a day before the arrival of the telegram which announced his sudden death, he stated that he was without doubt about where the different countries of the sagas are to be found. In letters to other friends he has given more detailed statements, which I have not yet seen.

STEENSBY was among the best of European geographers, and his sudden death, from apoplexy, was a great loss not only to our university but to science.

(Copenhagen.) J. W. S. JOHNSSON.

The organization of research in the history of technology on a commercial basis. — I have already devoted a note to the activity of Mr. FRANZ FELDHAUS and of the count KARL VON KLINCKOWSTROEM in the *Revue générale des Sciences*, t. XXIII, p. 421. Paris, 1912. There is no use repeating what I said there and then, but I wish to complete and correct the information which I gave. For one thing the great encyclopaedia on the history of technology which was to appear in 1918 (?) has not appeared. Of course, the war happened, and maybe Mr. FELDHAUS realized after a while that his former plans were far more ambitious than he could realize at the beginning : that is a common experience. But Mr. FELDHAUS published in 1914 an excellent book entitled *Die Technik der Vorzeit, der geschichtlichen Zeit und der Naturvölker*. Ein Handbuch für Archäologen und Historiker, Museen und Sammler, Kunsthändler und Antiquare, mit 873 Abb., XV p. + 1 400 col., which contains a large amount of facts. Their

selection is certainly capricious, yet we must be thankful to the author for his extraordinary industry and perseverance.

The *Quellenforschungen* FELDHAUS *zur Geschichte der Technik und Industrie*, Berlin-Friedenau are now (since June 3, 1919) organized as a limited company whose aim is the study of the history of technology and industry, the commercial exploitation of the results of these studies and the publication of the *Geschichtsblätter für Technik und Industrie* (1). I extract from the first report (1920) the following information. The scientific leaders are FELDHAUS and KLINCKOWSTROEM; the capital, 125 000 marks in money plus the following assets: (1) an index of facts (ca. 80.000 cards); (2) an index of names (ca. 22,000 names); (3) an index of anniversaries (ca. 2,500 data); (4) a collection of photos and slides (ca. 10,000 photos); (5) archives containing autographs, etc.; (6) a technical library of 6,400 vol.; (7) a collection of engravings (ca. 12,000 items).

The FELDHAUS Institute carries on the following activities: Distribution of historico-technical information to collaborators, museums and colleagues for scientific purposes (gratis); investigations in connection with patents; preparation of historico-technical publications for industrial firms, to be used by them as advertizing matter or to be published apropos of an anniversary or jubilee; genealogical research relative to industrials; preparation of historico-technical articles for magazines. Finally, preparation of collections of industrial antiquities (objects, prints, etc.) for industrials! This combination of science and business is very curious. At any rate quite a number of good publications already owe their existence to the cooperative efforts of the FELDHAUS institute and of industrial firms (2). The idea is sound. A list of these publications may be obtained by application to the Quellenforschungen FELDHAUS, Berlin-Friedenau.

G. SARTON.

Iconography of Science. — I would very much like to develop an *iconographical* department in *Isis*, but have no time to take charge of it myself. Will no one volunteer to undertake this excellent piece of work? It would be useful for ex. to publish a periodical account of the medals devoted to scientists (some of the best might be reproduced each year on a plate), and of the best painted, engraved or sculptured portraits. The activity of the department might be extended to the past (that would be exceedingly useful indeed) and it might either

(1) *Isis*, III, 370.
(2) For ex., *Isis*, IV, 216.

prepare the publication of a series of iconographical monographs, or simply chronicle, as they happen, the main facts and events of interest to collectors of scientific portraits, — the most precious specimens being eventually reproduced. This iconographical chronicle would interest not simply the collectors, but every historian of science who realizes the importance of the human element. Will anybody step forward? G. S.

Reviews

Lucrèce. — *De la Nature*. Texte établi et traduit par Alfred Ernout. (Collection des Universités de France publiée sous le patronage de l'Association Guillaume Budé) 2 vol. Paris, Les Belles Lettres 1920. [20 fr.]

Cette nouvelle publication du sublime poème de Lucrèce me donne l'occasion de parler de la *Collection des Universités de France* qui mérite à tous les points de vue les plus grands éloges. Les textes, tant grecs que latins, sont admirablement édités : ils sont établis avec le plus grand soin par des maîtres, revisés par d'autres (1) ; les textes latins (ou grecs) et français sont imprimés en regard en caractères à la fois élégants et faciles à lire. Enfin il est possible d'acheter soit le texte seul, soit la traduction seule, soit les deux imprimés en regard.

Cette collection est publiée sous les auspices de l'Association Guillaume Budé fondée d'ailleurs dans ce but exprès. J'éprouve une très grande joie à pouvoir exprimer dans *Isis*, l'organe du Nouvel Humanisme, mes vœux les plus sincères pour le succès de cette noble initiative. Ce succès me tient fortement à cœur, car il est clair que l'avenir de l'humanisme en France y est intimement lié. Le renouveau d'intérêt dans les classiques grecs et latins est un des résultats les plus heureux de la guerre. Il n'est pas spécial à la France; j'en ai vu des preuves évidentes en Italie et en Angleterre. Dans les pays de langue anglaise la « Loeb classical library » a beaucoup contribué à renouer les liens entre l'antiquité et le présent. Un grand nombre de volumes tant grecs que latins ont déjà paru dans la collection anglaise (chacun d'eux contenant le texte et la traduction anglaise en regard). Il est bon de remarquer toutefois que les volumes français ne sont aucunement inférieurs aux volumes anglais et qu'ils sont beaucoup moins chers (ils coûtent moins de la moitié !). De plus les membres de l'Association Guillaume Budé (cotisation, 10 francs par an) jouissent d'une réduction de 25 p. c. sur toutes les éditions et leur cotisation est remboursable en volumes ! Au moment où j'écris, les ouvrages suivants

---

(1) Par ex., le Lucrèce a été revisé par Goelzer.

ont déjà paru : en latin, les Satires de PERSE et trois discours de CICÉRON ; en grec, quatre tragédies d'ESCHYLE, les Caractères de THÉOPHRASTE et cinq dialogues de PLATON.

Le texte de la présente édition de LUCRÈCE repose sur une révision et collation nouvelles des deux manuscrits fondamentaux de Leyde. Il est précédé d'une courte introduction résumant nos connaissances sur la vie et l'œuvre du poète. La traduction tout en suivant le texte latin de très près, est fluide et agréable à lire. Si tous les volumes de la collection sont aussi satisfaisants que celui-ci, le succès est certain.

GEORGE SARTON.

Steensby, H. P. [1875-1920]. — The Norsemen's route from Greenland to Wineland. 109 p., illustr., 3 maps. Copenhagen, HENRIK KOPPELS, 1918.

Reprinted with slight alterations from vol. 56 of *Meddelelser om Grönland*, Copenhagen 1917. A study of capital importance completing GUSTAV STORM's investigations. While Helluland and Markland have long been identified with the N. E. and the S. E. coasts of Labrador, no one had yet been able to localize Wineland in a fairly convincing manner. The author believes to have solved this riddle and identifies Vinland (Wineland) with a tract about St. Thomas in the estuary of the St. Lawrence or in a wider sense with the St. Lawrence valley. STEENSBY has made a deep study of the sources, that is, ADAM OF BREMEN (ca. 1075) and the sagas. He accepts STORM's theory that the saga of ERIC THE RED (ab. 1200) is of considerably greater value than the *Graenlendingapáttr*. ERIC's saga knows of only two voyages to Wineland : the first was LEIF THE FORTUNATE's, in 1000, the other THORFIN KARLSEFNI's, which most likely took place in 1003-1006. The saga deals particularly with the latter voyage. After the first publication of this memoir large subventions had been awarded to STEENSBY to enable him to complete his investigations by repeating the early norsemen voyages. Unfortunately he died suddenly on board the liner FREDERICK VIII which took him back from America to his country. He was only 45 years old (see *Isis*, IV, 43). G. S.

Istituto di Studi Vinciani in Roma, diretto da MARIO CERMENATI. Per il IV° Centenario della Morte di LEONARDO DA VINCI, II Maggio MCMXIX. Bergamo, Istituto Italiano d'arti grafiche, XX + 442 p., molte illustr.

The Institute for the study of LEONARDO DA VINCI established in Rome has taken advantage of the fourth centenary of LEONARDO's death

to produce its first publication. It is a great pity that untoward circumstances obliged them to prepare it in such haste that the general result is rather disappointing. This hotchpotch contains, however, a few good morsels, and the most charitable attitude that the critic can take is to concentrate the reader's attention on the best pieces and help him forget the rest.

The following articles are of especial interest : Elia Millosevich, Leonardo e la luce cinerea (p. 17-19); G. B. De Toni, Intorno un codice sforzesco di Luca Pacioli nella Biblioteca di Ginevra e i disegni geometrici dell' opera « de divina proportione » attribuiti a Leonardo (p. 41-74); Luca Beltrami, Il volto di Leonardo (p. 75-95); Giuseppe Favaro, Plinio e Leonardo (p. 133-138); Gugl. Bilancioni, Leonardo e la fonetica biologica (p. 159-176); Mario Cermenati, Leonardo in Valtellina (p. 209-235); Guido Mazzoni, Leonardo scrittore (p. 291-305); Ant. Favaro, La morta, la tomba, il monumento di Leonardo (p. 309-317); Léon Dorez, Léonard au service de Louis XII et de François I (p. 359-376); Enrico Carusi, Per il « Trattato della Pittura » di Leonardo. The last paper contains a list of references to the manuscripts for each of many chapters of Ludwig's edition of the Trattato.

If the editors had had the courage to publish only the above named essays and to eliminate the many pompous and futile declarations which stuff the book, their publication would have been more creditable. But not only have they lacked this elementary courage, — but they have added some irrelevant rubbish of their own. For inst. articles on the king of Italy and President Poincaré, *with their portraits!* To show how uncritical this performance is, it will be enough to say that the editor has let pass without any correction Mr. Poincaré's reference to the Valenciennes drawings (« les fameux dessins de Valenciennes », p. 145) when every Leonardo scholar knows that there are no such drawings in Valenciennes !

The illustration is rich but much of it has no connection with the text. There are good photographs of Vinci and Amboise. The publication is luxuriously printed, but this very luxury in a time of scarcity makes the lack of internal order and beauty more shocking.

I am looking forward to the other publications promised by the Institute (1), hoping that they will make us forget this first one as quickly as possible. G. S.

---

(1) One of them by Lionello Venturi has already appeared and is very good indeed. See *Isis*, III, 458.

Jaeger, F. M. — Historische Studien. Bijdragen tot de kennis van de geschiedenis der natuurwetenschappen in de Nederlanden gedurende de 16e en 17e eeuw. Met 45 figuren en portretten, 276 p. Groningen, WOLTERS, 1919. [7 fl. 50.]

A series of six historical studies previously published in Dutch reviews:

I. THEOBALD VAN HOGELANDE (b. ab. 1560 in Middelburg, Zeeland, d. 1608), a very good type of XVIth century alchemist of the best kind, that is, an honest and learned man, but lacking common and critical sense. JAEGER gives us a very elaborate study of his family, and of his life and work (p. 1-50).

II. DAVID VAN GOORLE as atomist, and the VAN GOORLE family in the N. Netherlands — DAVID VAN GOORLE was born in 1591, January 15 in Utrecht, he died in 1612, April 21 in Cornjum. He is known by two posthumous works: DAVIDIS GORLAEI *Ultrajectini Exercitationes Philosophicae quibus universa fere discutitur Philosophia Theoretica, et plurima ac praecipua Peripateticorum dogmata evertuntur*, Leiden, 1620; *Idea Physicae, cui adjuncta est Epistola cuiusdam Anonymi de Terrae motu*, Utrecht, 1651. GORLACUS was an important personality, a forerunner of DESCARTES and also with the German DANIEL SENNERT (1572-1637), a forerunner of ROBERT BOYLE (p. 51-98).

III. ANSELMUS BOËTIUS DE BOODT (born in Brugge, Flanders 1550 — d. Brugge, 1632, June 21). Belgian naturalist and traveller, physician to the emperor RUDOLPH II. His main work is his *Gemmarum et Lapidum Historia, quâ non solum ortus, vis et pretium, sed etiam modus quo ex illis olea, salia, tincturae, arcania et magisteria arte chymica confici possunt, ostenditur*. Hanau, 1609, which remained the standard book of mineralogy for a considerable time, and has been frequently published. A. DE BOODT was a very learned and intelligent man, who although still a peripatetician has already a modern outlook; he was a Roman Catholic and his culture was chiefly Latin (as opposed to Germanic) (p. 99-149).

IV. BEREND COENDERS VAN HELPEN, a XVIIth century alchemist of Groningen. This Dutch alchemist was born in Groningen, 1601, June, he died in Copenhagen, 1678, January. His was rather an unsignificant personality (p. 150-170). He is not included in FERGUSON's Bibliotheca Chemica.

V. WILLEM HOMBERG (born in Batavia, 1652, January 8 — d. 1715 September 24). A great chemical experimenter, to whom many discoveries are ascribed; not a great scientist. JAEGER gives us a list of his scientific papers, from 1591 to 1714, with critical notes (p. 171-197).

VI. Three hundred years of chemical teaching at the University of Groningen, followed by bibliographical lists (p. 198-254).

The author has provided many elaborate foot notes elucidating the text (*ex. gr.* giving information upon the persons quoted) and there is also a good index. His book is an important contribution to the history of Science in the Netherlands in the XVIIth and XVIIIth centuries. For other publications of the same author see *Isis*, IV, 32-38, 83.

G. S.

Hellmann, G. — Aus der Blütezeit der Astrometeorologie. J. STÖFFLERS Prognose für des Jahr 1524 (*Beiträge zur Geschichte der Meteorologie*, Nr. 1, S. 5-102; *Veröffentlich. des Kgl. Preuss. Meteorologischen Instituts*, Nr. 273) Berlin, BEHREND, 1914.

The « Almanach noua », edited by the astronomer JUSTUS STÖFFLER of Tübingen and JAKOB PFLAUM of Ulm, Ulm 1499 (1) had announced for the year 1524, an extraordinarily large amount of planetary conjunctions in Pisces and hence had predicted that extraordinary events would occur in that year. At first little attention was paid to this prognosis, but in 1517, AGOSTINO NIFO, Suessano, published in Florence a book entitled *De falsa diluvi prognosticatione quae ex conventu omnium planetarum, qui in piscibus continget, anno 1524 divulgata est*, which started a furious polemic, involving 56 authors (2) and causing at least 133 (3) writings to be printed. Never were so many books published on an astrological topic, and this is partly explained by the fact that this controversy occurred when astrology was at its height.

HELLMANN'S fundamental memoir is chiefly devoted to a masterly description of these writings, preceded by a short history of astrology in general and of this special controversy in particular. Most of these writings appeared between 1517 and 1524; a few of 1524 or of a later date, were published to explain why no flood happened on the fatidical year. The memoir is followed by 34 full-page fac-similes of the most important title-pages. It is to be noted that NIFO'S writing of 1517 which started the controversy, if still extant, must be exceedingly rare, for HELLMANN failed to discover a copy of it, although he applied to 52 Italian libraries; of the 2nd ed. (Naples, 1519) he knows

(1) Incorrectly described by HAIN (15085) and COPINGER. Described by HELLMANN in his Neudrucke..., Nr. 13, 1901.

(2) Amongst whom, 20 Italian, 19 Germans and Austrians, 5 Spaniards, 4 Poles, etc.

(3) 62 in Latin, 50 in German, 10 in Italian, etc.

only two copies, one in the National Library of Naples and the other in his own library. This is a capital contribution to the history of astrology: it increases materially our already heavy debt to its indefatigable author. G. S.

Anthiaume, L'Abbé A. — *Cartes marines, constructions navales. Voyages de découverte chez les Normands, 1500-1650.* Préface de l'Amiral Buchard, 2 vol., xiv + 566 p., 597 p, Paris, E. Dumont, 1916.

Ces deux volumes contiennent le fruit de dix années de recherches du savant aumônier du Lycée du Havre, connu déjà par plusieurs travaux sur l'astrolabe, l'histoire de la cartographie et de la science nautiques. Voici le plan de son œuvre : Courte introduction sur la carte marine avant Colomb. — Livre I. (1). Les origines et les caractères distinctifs de la cartographie normande; (2). Cartographes et cartes du xvi^e^ siècle; (3). Idem du xvii^e^ siècle. — Le livre II est consacré aux découvertes des Normands dans le vieux monde et le livre III à leurs découvertes dans le nouveau monde. Ces deux livres sont subdivisés géographiquement. — Le livre IV s'occupe de la science et de l'art des Normands d'après leurs cartes marines : (1). Quelques particularités des cartes normandes; (2). L'art des constructions navales en Normandie d'après la lecture des cartes complétée par d'autres documents; (3). Les divers systèmes de projection cartographique utilisés par les Normands; (4). Influence de la cartographie normande en France et à l'étranger. Vingt-et-un appendices contiennent des documents d'archives et diverses notes, particulièrement des études de nomenclature topographique. Un bref index analytique complète cette importante publication. G. S.

Taylor, Henry Osborn. — *Thought and Expression in the XVIth century*, 2 vol., xiv + 427 p., iv + 432 p. New York, Macmillan, 1920. [$9].

A new book by the accomplished American humanist, Henry Osborn Taylor, is always a pleasant event. We owe him already an imposing series of historical syntheses; to wit, his *Ancient Ideals*, 2 vol. 1900 (2nd ed. 1913); *The classical Heritage of the Middle Ages*, 1901; *The Mediaeval Mind*, 2 vol. 1911 (2nd ed. 1914, a third ed. has recently appeared).

The purpose of his new work is « to give an intellectual survey of the xvith century, to set forth the human susceptibilities and faculties

of this alluring time, its tastes, opinions and appreciations, as they expressed themselves in scholarship and literature, in philosophy and science and in religious reform ». To give a fair appreciation, one should understand from the beginning, that the author's aim is not to offer us a really comprehensive survey; his treatment is decidedly interpretative, selective, one might add, capricious. He is at his best when he can sketch a great personality, which he happens to like : his interpretations of MACHIAVELLI, of GUICCIARDINI, of PHILIPPE DE COMMYNES are excellent; his portraits of ERASMUS, of RABELAIS, of CALVIN are superb. A scholar will object that he quotes but few authorities and not always the best, and that he is very inconsistent in the spelling of proper names, — but these are venial sins in a book of this kind, which must be judged from the literary rather than from the scholarly point of view. The subjective and selective nature of this survey is apparent at the first glance, for it is divided into 5 parts : Italy; Germany; France; England; Philosophy and science. Flanders and Spain, not to speak of other European countries, are entirely neglected. The fifth part is rather a sort of appendix. Well may Mr. TAYLOR say that the advance of science is international, and hence falls necessarily out of the frame of the four first parts. That is not entirely true, and this argument is especially specious in the mouth of one who claims that he is interested chiefly in form and expression. The substance of science is international, but its expression is influenced by national and local peculiarities almost to the same extent as other human activities. We would expect a humanist of Mr. TAYLOR's type to be primarily interested in the human side of science, and this brings us back into the national and racial frames. LEONARDO DA VINCI is as pure an Italian as MACHIAVELLI. The greatest internationalist of this period is not a scientist, but a man of letters — ERASMUS. The truth is, that the author has not integrated his knowledge of scientific advance with the rest of his historical information. However, we can but admire him for the pains he is taking to include the development of Science in his broad vision. It proves the vitality and the youth of his mind. One might also object that his survey is not sufficiently centered upon the period which he has set himself to describe. He deals at great length on the one hand with early Florentine Platonists and with NICHOLAS OF CUSA, on the other with men like HARVEY, KEPLER, BACON, GALILEO, who belong to the XVIIth century. One might even say that LEONARDO is more a man of the XVth than of the XVIth century; he marks the climax of the early Renaissance, just as the *Divina Commedia* is the apotheosis of the XIIIth century. This fifth section is divided into five chapters : the first is an introduction dealing with scholasticism, neo-Platonism and NICHOLAS OF CUSA, the second a skil-

ful portrait of LEONARDO, in the third entitled Anatomy, Physiology and Disease, he speaks among others of VESALIUS, FRACASTORO, PARACELSUS; the fourth is devoted to the « Revolution in Astronomy and Physics » (PURBACH and REGIOMONTANUS are not even quoted!); the last is a study of the « new philosophers » : TELESIO, CAMPANELLA, BRUNO and BACON.

One must be grateful to Mr. TAYLOR for having included science in his survey; by doing so, he has given an example which I hope other historians will follow. However, I cannot recommend this part of his work to the historians of science; on the contrary the reading of the four first parts will be very useful in helping them to construct the literary and philosophical background of their own historical studies.

GEORGE SARTON.

Otto Sperling. — *Studienjahre*. Nach dem Manuskript der Kgl. Bibliothek zu Kopenhagen herausgegeben von WALTER G. BRIEGER und JOHN W. S. JOHNSSON, 133 p. Kopenhagen, HENRIK KOPPELS Verlag 1920.

The manuscript which is now published *in extenso* for the first time was completed in 1673 in the « Blaataarn » (Blue Tower) of the old royal palace of Copenhagen, wherein OTTO SPERLING (born in Hamburg, 1602) was kept prisoner from 1664 to his death 17 years later. The authors have given us a diplomatic transcription of the ms. and have added ample notes, including *ex. gr.* biographical information on all the persons named in it. This is the first study devoted to STERLING in which sufficient stress is laid on the many points of his autobiography which are of special interest to the historian of science. For this autobiography is an impressive human document which helps us to understand the life of a student of botany and other sciences in the XVIIth century; it contains also many personal reminiscences of the contemporary scientists. The authors have made use of SPERLING's unpublished correspondence (kept at the Copenhagen library) to elucidate or correct the text of his biography; they propose to publish eventually some fragments of this correspondence with such men as DE LE BOE SYLVIUS, JOH. RUD. GLAUBER, JEAN BRUN of BERGERAC. This carefully edited and well printed book is a valuable addition to our knowledge of scientific life and thought in the XVIIth century.

G. SARTON.

Blanchet, Léon [Laiz, Ain, 1884-1919]. — CAMPANELLA (Collection historique des grands philosophes), 596 p. Paris, ALCAN, 1920.

This book offers us a very complete study of CAMPANELLA, indeed the most comprehensive study of his life and works available to-day. Of course the author has taken full advantage of previous investigations, and especially of the fundamental works published by LUIGI AMABILE and J. KVAČALA, but he has made a new and deep study of CAMPANELLA's writings and done a great deal of original thinking. Such a survey is exceedingly important not simply because of the greatness and singularity of its object — for CAMPANELLA, poet, astrologer, conspirator, social and religious seer, courageous defender of GALILEO, is a most attaching personality — but even more because it enables us to measure more accurately what the Italian Renaissance bequeathed to DESCARTES, SPINOZA and LEIBNIZ. As the author says : « La pensée de CAMPANELLA, où se perpétuent, enrichies de conceptions neuves ou d'interprétations originales, toutes les traditions philosophiques du XVI^e^ siècle, aussi bien dans le domaine de la physique, de la psychologie et de la théorie de la connaissance, que dans celui de la magie naturelle, de la religion et de la morale, c'est le legs de la Renaissance à la pensée du XVII^e^ siècle. »

BLANCHET's book is divided in eight parts as follows : I. CAMPANELLA's *life and character*. This is of course largely based on AMABILE, but there are many original suggestions. The most interesting of these perhaps is the one answering the query : How could CAMPANELLA remain a member of the Catholic Church ? BLANCHET explains CAMPANELLA's attitude by comparing it with that of ALFRED LOISY as it is candidly revealed in the latter's autobiography (see for inst. the most pathetic fragment quoted on p. 104). — II. *Physics and Psychology*. BLANCHET compares CAMPANELLA's with scholastic ideas and also with TELESIO's philosophy. — III. *His conception of science and art*. Influence of XVIth century occultism on CAMPANELLA : PARACELSUS, AGRIPPA OF NETTESHEIM, G. B. DELLA PORTA. On the other hand, influence of GALILEO. CAMPANELLA's classification of sciences. His æsthetics. — IV. *Metaphysics*. — V. *Morals and religion*. — VI. *Sociology and positive politics*. It is in this part that BLANCHET describes and criticises CAMPANELLA's great Utopia : the City of the Sun, — his conception of a government largely based upon scientific knowledge as he understood it (that is, a mixture of science and astrology, solid common sense and superstition. Think for inst. of his ideas on eugenics), his educational theories. — VII. *Conclusion*. The balance sheet of the Renaissance and the influence exerted by CAMPANELLA upon seventeenth century thought

and especially upon SPINOZA (natural religion and pantheism), upon LEIBNIZ (panpsychism), upon DESCARTES (idealism). — VIII. *Bibliography* : (1) CAMPANELLA's printed works; (2) the manuscripts; (3) his correspondence; (4) the publications devoted to him. — The absence of an index is deplorable.

The best edition of *La Città del Sole* appeared too late to be included in this bibliography. Hence it is well to say a few words of it (on the basis of MIELI's review in his *Archivio*, I, 423-424). It has been prepared by GIUSEPPE PALADINO (Napoli, GENNARO GIANNINI, 1920) and represents chiefly the primitive version of 1602. Three later versions date respectively of ab. 1611, 1623, and after 1631. — CAMPANELLA's *Apologia pro Galilaeo*, written in 1616 was published in Francfort in 1623.

BLANCHET's book is prefaced by a short biographical study written by one of his masters, LÉON BRUNSCHVICG. It is sad to think that such a promising career has been stupidly cut short by a premature death. He died from influenza at the age of thirty five. He had written a thesis entitled « Les antécédents historiques du Je pense, donc je suis » and had contributed two important papers to the *Revue de Métaphysique et de Morale* : one in 1919 on « L'attitude religieuse des Jésuites et les sources du pari de PASCAL » ; the other (1920), written a month before his death, was an essay devoted to J. ROGER-CHARBONNEL's book on « La pensée italienne au XVI^e^ siècle et le courant libertin » (Paris, CHAMPION, 1919), a book which BLANCHET was unusually well prepared to criticize. CHARBONNEL's book is an important contribution to the history of philosophy as it helps us to understand better the transition from scholasticism to the religious thought of the XVIIth century and also from Averroistic libertinage to modern freethought. It seems, however, that CHARBONNEL's knowledge of CAMPANELLA was insufficient, and it was BLANCHET's plain duty to correct and complete his investigations.

GEORGE SARTON.

Dussaud, René. — *Les civilisations préhelléniques dans le bassin de la mer Egée*; 2^e^ éd. revue et augmentée, x+482 p. Paris, GEUTHNER, 1914.

This second edition of DUSSAUD's work might be considered as a new work, for the amount of text and illustrations is almost doubled. The illustrations, chiefly the 14 plates of which 5 are coloured, are splendid. There are also very good maps and an excellent synoptic table showing the chronological relations between the ancient civilizations. The text is a very simple, very full and very clear account of the

results of archæological research in the Mediterranean world (1). Mr. Dussaud examines successively the archæological evidence furnished by excavations in : (1) Crete; (2) the Cyclades; (3) Troy; (4) Greece proper; (5) Cyprus. The following (sixth) chapter deals with Ægean influence in Egypt and Syria and contains an interesting comparison between Cypriot and Phenician art (p. 326) : « La définition de l'art phénicien comme un compromis entre l'art égyptien et l'art assyrien est insuffisante; il faut y joindre une forte influence venue de Chypre, telle que, dans certains cas, on substituera au terme d'art phénicien celui d'art chypriote ». — Chapter VII is a very long and elaborate study (p. 327-413), which Mr. Dussaud was of course especially qualified to undertake, on Cults and Myths. The last chapter is a sort of synthesis, naturally very hypothetical, of our knowledge of the Ægean peoples. It is divided into 4 main sections respectively devoted to Navigation, Writing, Language and Race.

Let us hope that Mr. Dussaud may be persuaded to publish a supplementary volume explaining the facts which have been brought to light since 1914. As a conscientious record of archæological facts, scientifically described, his volume of 1914 is of lasting value, if he will only take the trouble to bring it up-to-date in a new publication. Apropos of this I would like to remark that such supplementary publications have at least one advantage upon the entirely new ones, in that they do not oblige the reader to go back over familiar ground, but give him only that which is likely to interest him most.

G. Sarton.

Budge, Sir **E. A. Wallis**. — ***An Egyptian hieroglyphic dictionary***. With an index of English words, king list and geographical list with indexes, list of hieroglyphic characters, Coptic and Semitic alphabets, etc., cliv + 1356 p., 28 cm. London, John Murray, 1920. [15 guineas].

It is unnecessary to analyze this monumental dictionary, which the adepts already have in their possession, but it is well to draw the attention of the profane to its introduction. By the way, an enormous amount of excellent stuff is buried in the introductions of many of the

(1) It was remarkably up-to-date in 1914. Apropos of this, I must apologize for publishing this review of a capital book so late. It is not my fault. When I had to abandon my Belgian home in Oct. 1914, I took special pains to protect the books which had been sent me for review in *Isis* and had not yet been reviewed, that is, the books which did not yet belong to me. However I did not find Dussaud's book among the others in 1919, and would have entirely forgotten it but for a note recently discovered.

dictionaries which we use every day. If this stuff were published in ordinary book-form it would certainly be read and used to a far larger extent, — but how many stop to study the introductions of their dictionaries and encyclopedias? The introduction to BUDGE's hieroglyphic dictionary retraces the history of Egyptian lexicography — and that involves necessarily other developments of Egyptian scholarship — from 1761 on, that is, from the day that the abbé J. J. BARTHÉLEMY showed satisfactorily that the « cartouches » contained royal names. This history is a much longer story than most scholars would expect, and I will not attempt to outline it. The best that I can do is simply to give the headings of the chapters : YOUNG's hieroglyphic alphabet and vocabulary; RICHARD LEPSIUS and SAMUEL BIRCH; BIRCH's « Sketch of a hieroglyphical dictionary » (London, 1838); CHAMPOLLION's « Dictionnaire Égyptien en écriture hiéroglyphique » (Paris, 1841); BIRCH's dictionary (London, 1867); HEINRICH BRUGSCH and his « Hieroglyphisch-Demotisches Wörterbuch » (7 vol., Leipzig, 1867-1882); PIERRET's « Vocabulaire hiéroglyphique » (Paris, 1875); SIMEONE LEVI's « Vocabolario geroglifico copto-ebraico » (Torino, 1887-1894); HAGEMANS « Lexique français-hiéroglyphique » (Bruxelles 1896). The interest of this historical analysis is greatly increased by many facsimile reproductions of the older lexicons. BUDGE then proceeds to explain the inception, development, contents and methods of his own dictionary. This part of his introduction also is of great interest to the historian of science, for apropos of the fundamental problem of transliteration, he gives us a good historical account of it and shows how the transliterated alphabet changed as knowledge increased. It is now generally agreed that Egyptian is fundamentally an African language, but it has long been maintained that it was closely related to the Semitic languages; the history of this controversy is briefly told.

The present dictionary includes nearly 24,000 forms of Egyptian words collected from texts of all periods between the IIIrd dynasty and the Roman times. It is divided as follows : list of the sources; list of the most frequent hieroglyphic characters with their phonetic values together with their significations when employed as determinatives and ideographs; various Oriental alphabets; the dictionary proper in alphabetical order (1065 p.); very copious index of English words; index of Kings; indexes of geographical names (English, Coptic, Greek, Hebrew; Assyrian and Persian, Ethiopic, Syriac, Arabic); Greek, Coptic and Oriental indexes. The work ends with a catalogue of Messrs. HARRISONS' fount of Egyptian type (2863 items).

GEORGE SARTON.

Marshall, F. H. — *Discovery in Greek lands.* A sketch of the principal excavations and discoveries of the last fifty years, XII+127 p., 38 fig. Cambridge, University Press, 1920. [8 sh. 6 d.]

An excellent little book which enables one to measure quickly how much has been added to our knowledge of Greek history by the use of archæological methods. Our literary sources are well-nigh exhausted and there is not much hope of finding supplementary information of this kind at least on the earliest times; on the contrary there is still an enormous amount of unexcavated material, and one has good reason to hope that the application of archæological methods will still materially increase our knowledge of the distant past. In other words, the progress of positive science obliges literary men to surrender to scientists their main stronghold : ancient history. The book is divided as follows (I quote for each period the main excavated sites) : I. *Earlier prehistoric period* (before 1000 B. C.) : Knossos and Crete, Phylákopi, Mycenae, Tiryns, Troy, prehistoric N. Greece, Cyprus. — II. *Later prehistoric period* (ab. 1000-700 B. C.) : Olympia, Sparta, Argos, Athens, Thera. — III. *Earlier historic period* (ab. 700-500 B. C.) : Rhitsóna, Corinth, Ephesus, Miletus, Naukratis, Rhodes, Daphnae. — IV. *Later historic period* (ab. 500-150 B. C.) : Tanagra, Tegea, Mantinea, Megalopolis, Rhodes, Pergamon, Ephesus, Priene, Magnesia, Sardes. — V. *Temple sites*. Thermos, Kabeireion, Ptoïon, Oropos, Epidauros, Eleusis, Ægina, Lykosura, Kos, Samos, Assos. — VI. *Great centers of Greek Life*. Dodona, Delphi, Olympia, Delos. — VII. *Some isolated discoveries* : Corfu, disc., Giölbaschi-Trysa, Sidon, Antikythera find, Mahdia find. — There is also a select bibliography, a chronological list of the main excavations (it would have been well to add the names of the main investigators and of the institutions employing them), an index, a good choice of illustrations (it is a pity, however, that no indication is given of the places where the represented objects are now exhibited). I hope that similar surveys will eventually be prepared for the other ancient civilization areas and that this one and the others will be kept up-to-date.

GEORGE SARTON.

Banerjee, Gauranga Nath. — *Hellenism in ancient India.* Second edition, thoroughly revised and enlarged, VIII+344 p., Calcutta, BUTTERWORTH, 1920.

The conclusion of Book I (introductory) is that « Greece has played a part, but by no means a predominant part in the civilization of ancient India. The evolution of Philosophy, Religion and Mythology

has gone along parallel but independent paths. India owes to Greece an improvement in Coinage and Astronomy but it had begun both; and in lyric and epic Poetry, in Grammar, the Art of Writing, the Drama and Mathematics, it had no need to wait for the intervention or the initiative of Hellenism. Notably perhaps in the plastic arts and especially in the details of some of the architectural forms, classical culture has acted as a ferment to revive the native qualities of the Indian artists, without robbing them of their originality and subtlety ». — Book II deals with the Hellenistic influence on the art of India : architecture, sculpture, painting, coinage. — Book III. The evolution of scientific and literary culture in India and Hellenism : astronomy, mathematics, medicine, art of writing, literature, drama. — Book IV. Independent evolution of religion, philosophy, mythology and fables in India and Greece.

This book strikes me as being at once well-informed (though KAYE's studies are not mentioned!) and for an Indian book, remarkably well-balanced. Each chapter is followed with a long bibliography, which is not exclusively English, but without dates! It is a great pity that the book is not illustrated, for it is impossible for those not familiar with the subject to follow the argument (*ex. gr.* on the arts) without illustrations. The first edition appeared in April 1919, the second in July 1920 : a well deserved success which should encourage the author to make further efforts to improve the following editions.

G. S.

James Haughton Woods. — *The Yoga-system of Patañjali.* Grand in-8° de XLI-384 p. (Harvard Oriental Series, 17). Harvard Univ. Press, Cambridge (Mass.), 1914.

Venu à l'indianisme par curiosité spéculative, M. WOODS, qui compte parmi les plus éminents philosophes américains, a fait ici œuvre de spécialiste. Il s'est persuadé à juste titre que la compétence philosophique devait aider à l'intelligence des doctrines indiennes, à la condition qu'un Occidental apprît à l'école des traditions indigènes le sens authentique des textes. Ainsi est né ce livre qui résulte à la fois d'études poursuivies aux Indes mêmes, et d'une réflexion très personnelle appliquée à l'interprétation des doctrines. D'où la valeur de cet ouvrage, et son originalité en comparaison des traductions antérieures. Il nous offre à propos des Sûtras de PATAÑJALI, que l'on attribue au IV^e^ ou au V^e^ siècle de notre ère, une version anglaise du *Châsya* imputé à VYÂSA (entre 650 et 850) et de la glose de VĀCASPATIMICRA (vers 850). La traduction est faite de main de maître; nous ne croyons pas la déprécier en lui reprochant d'être souvent, de par sa technicité, aussi

ardue a comprendre que le texte : c'est la rançon de toute version systématique ; ce n'est le défaut que des œuvres excellentes. Ajoutons qu'un tel ouvrage apporte à sa façon une contribution à l'histoire de la science, car les pratiques tant intellectuelles que physiologiques, dont se compose le Yoga, n'ont jamais cessé de supposer, pour les consciences indiennes, un ensemble de faits d'une objectivité incontestée. Cette dogmatique d'une certaine ascèse et d'un certain mysticisme implique la notion très rigoureuse d'une correspondance particulière entre le macrocosme et le microcosme.

P. MASSON-OURSEL.

J. S. Speyer. — Die indische Theosophie. In-8° de VIII-336 p. Leipzig, HAESSEL, 1914.

Recueil de conférences, ce travail est œuvre de vulgarisation, mais traitée par un spécialiste consciencieux, qui a représenté dignement, durant sa laborieuse carrière (1849-1913), l'indianisme hollandais. Le dernier tiers du volume n'offre plus la concision des deux cents premières pages ; toutefois le lecteur y trouvera encore de justes aperçus et la dénonciation d'erreurs courantes. Le principal mérite de l'exposé qui remplit les deux premiers tiers de l'ouvrage est d'avoir cherché parmi les explications du système du monde et les doctrines de salut — constitutives de la théosophie au sens que S. lui prête comme M. OLTRAMARE, — les divergences d'inspiration à travers l'unité apparente des syncrétismes traditionnels. Ainsi l'on a remarqué fort à propos le caractère non védique du Yoga, la diversité des écoles dans Bhakti-mârga, le paradoxe de l'application à l'Être suprême de la doctrine des avatâras. Toutes sortes d'arrière-pensées, de réserves (*allerlei Rückhalte und Vorbehalte*, 182) sont très finement signalées. Mais pourquoi un silence sur le vaste développement spéculatif des écoles mahâyânistes ?

(Voir la notice nécrologique consacrée à JACOB SAMUEL SPEYER par J. PH. VOGEL dans le *Journal R. As. Soc.*, Jan. 1914, pp. 227-232.)

P. MASSON-OURSEL.

Ernst Windisch. — *Geschichte der Sanskrit-Philologie und indischen Altertumskunde*, I Teil. (Grundriss d. indo-arischen Philol. u. Altertumskunde, I Bd., I Heft B.) Gr. in-8° de 208 p. Strassburg, TRUBNER, 1917. [12 Mk. 50.]

Exposé remarquablement précis et complet de l'histoire de l'indianisme jusqu'à l'œuvre de LASSEN. La contribution de chaque indologue

est définie avec objectivité, sans partialité pour ou contre aucune école ou nationalité. Le seul arbitraire est dans le choix du *terminus a quo* : pourquoi cette revue de l'*indische Altertumskunde* commence-t-elle à la fin du XV^e^ siècle, passant sous silence les efforts de l'antiquité comme du Moyen Age pour explorer l'Inde? VASCO DE GAMA n'a fait que suivre les exemples de MARCO POLO, de BENJAMIN DE TUDELA, de PTOLÉMÉE. En ce qui concerne l'intérêt porté par l'Allemagne aux découvertes de l'indianisme, l'ouvrage, malgré son austère *Gründlichkeit*, ne supplante pas le travail d'ARTHUR F. J. RÉMY, *The Influence of India and Persia on the Poetry of Germany* (Columbia Univers., Germanic Studies, I, No IV, 1901). Souhaitons que l'interruption de la publication à Strasbourg du *Grundriss* qui a fait voir le jour à tant d'œuvres maîtresses, ne compromette pas plus longtemps l'apparition de la seconde partie de ce monument élevé à la gloire de l'indologie.

P. MASSON-OURSEL.

M. Winternitz. — *Geschichte der indischen Literatur*. 2 in-8° de XIII-505 et VI-288 p. Leipzig, AMELANG, 1908 et 1913.

Œuvre de mérite et de grande utilité, cette histoire de la littérature indienne sera, une fois achevée, la plus lucide, la plus complète des entreprises similaires. Des deux parties qui ont déjà vu le jour, la première, traitant de l'antiquité brahmanique, contient deux cents pages sur la littérature védique, et autant sur les épopées ainsi que les purâṇas; la seconde est consacrée au Bouddhisme, envisageant la littérature pâlie, canonique ou non, puis la production bouddhique de langue sanscrite. Ces deux volumes constituent dès à présent un excellent manuel, mais où le double souci d'objectivité et de clarté ont le plus souvent dissuadé l'auteur de nous offrir autre chose que des appréciations moyennes, volontiers et délibérément équidistantes des thèses plus tranchées que présentent des ouvrages plus personnels. Le maître de M. WINTERNITZ, BÜHLER, paraît avoir gardé son secret quant à la manière de concilier une extrême originalité et une impeccable objectivité. Mais sans doute est-ce le désir de bannir tout subjectivisme qui a inspiré l'élève fidèle dans la réserve et la mesure de ses jugements. Au surplus, alors même qu'il n'apporterait qu'un tableau schématique de cette immense production intellectuelle qu'a enfantée le génie de l'Inde, l'ouvrage serait précieux, tant pour les savants que pour les profanes.

P. MASSON-OURSEL.

Abū-Manṣūr 'abd-al-Ḳāhir ibn-Ṭāhir al Baghdādī (d. 1037). — ***Moslem Schisms and Sects (Al-Farḳ Bain al-Firaḳ) being the history of the various philosophic systems developed in Islam.*** **Part I, translated from the Arabic by KATE CHAMBERS SEELYE. (Columbia University Oriental Studies, XV) VIII+224 p. New York, Columbia University Press, 1920.**

This translation is made from the text published in 1910 by MUḤAMMAD BADR of Cairo, a text based upon one single manuscript and not free from errors (see I. GOLDZIHER, *Zeits. d. Deut. Morgenl. Gesell.*, Bd. 65, 1911, p. 349). It will enable students who cannot read the Arabic original to make a deeper study of Mohammedan thought. Similar writings by IBN ḤAZM and AL SHAHRASTĀNI being already available it is interesting to compare these three writers, using for this comparison the material offered by Mrs. SEELYE in her introduction. But before doing this it is well to recall that Moslem sects are not as spontaneous as, say, Christian sects. Indeed many of them were invented simply to justify the tradition according to which Islam would be divided into 73 sects. Hence a great number of sects separated by hairsplitting quibbles have existed either in reality or only in the brains of theologians, who do not at all agree on their classification. The Sunnites recognize no sect within the orthodox fold, but are divided into the four great schools, each of which recognizes the other : the Ḥanifite, the Mālikite, the Shafiite and the Ḥanbalite. Our three authors being Sunnites, agree thus far; their disagreements begin with the divisions of the Shiites. For the details see Mrs. SEELYE's book. Let us simply introduce the three authors :

AL BAGHDĀDĪ, born in Bagdad, died in 329/1037 (see *Encycl. of Islam*, under BAGHDĀDĪ). He was versed in 17 sciences and wrote many books. The work translated by Mrs. SEELYE is based upon the tradition : there shall be 73 sects in Islam, *of which one only shall be saved*. AL BAGHDĀDĪ does never lose sight of this form of the tradition, rejoicing all the time in his blessed orthodoxy. SHAHRASTĀNĪ was born in 467 or 479 and died in 548/1153. His work entitled *Kitāb al-Milal wa'l-Niḥal*, transl. by HAARBRÜCKER, Halle, 1850, is more scholarly, more carefully arranged, and he tries, not always successfully, to remain neutral. ['ALĪ IBN-AḤMAD IBN-SA'ĪD] IBN-ḤAZM [IBN-GHĀLIB IBN-ṢĀLIḤ ABŪ-MUḤAMMAD] was born in Cordova in 384/994. His book bearing the same title as that of SHAHRASTĀNĪ, partly transl. by FRIEDLÄNDER in *Journal Am. Or. Soc.*, vol. 28-29, 1907, is unfettered by tradition and absolutely neutral. As FRIEDLÄNDER says : « We may safely assume that each name recorded in his book represents an

historical fact and not as in the case of all other writers a mere product of the imagination ». This author is especially remarkable for his « breadth of outlook, power of observation and fairness of judgment ».

To conclude, anyone who cannot afford to make a long study of all the documents should read only IBN-ḤAZM's book. We must be grateful, however, to Mrs. SEELYE for having made accessible to us another source less valuable in itself yet worth considering. It is not possible to understand Moslem science if one does not know their religious thought; Mrs. SEELYE has given us one more key to their soul. We hope that the end of her translation will not be delayed too long.

GEORGE SARTON.

Goldziher, Ignaz. — *Le Dogme et la Loi de l'Islam*. Histoire du développement dogmatique et juridique de la religion musulmane. Traduction de FÉLIX ARIN, VIII-318 p. Paris, PAUL GEUTHNER, 1920.

This translation of GOLDZIHER's *Vorlesungen über den Islam* appears ten years after its German original and six after it was itself finished. Yet that does not mean that GOLDZIHER's work is in the least out of date and still less that it has been superseded by any later work. It is exactly as authoritative as it has been from the beginning and holds the same unique position among the books on Islam of the whole learned world. Those of us who are students of Islam know very well that GOLDZIHER is the father of us all; and while we may disagree with him on details, we have always an uneasy consciousness that he may be right after all. The title of the French translation — an admirable translation, often reading more easily, even for those who are familiar with German, than does GOLDZIHER's somewhat involved style — limits the book more narrowly down to theology and law than does the original *Lectures on Islam*. According to the chapter-headings the book covers (I) MOHAMMED and Islam; (II) the legal development; (III) the theological development; (IV) asceticism and mysticism; (V) the sects; (VI) later formations. To each is added an array of notes and references, intended for the student who has access to the original sources and covering in this translation 50 pages of small type. A hardly adequate index of fifteen pages, reproduced without additions from the German, closes the book. But the subject-matter is wider than these rubrics suggest. It is the whole essence and being — genus, species and differentia — of Islam, taking that term as correlative to Christendom. It is true that GOLDZIHER carefully avoids treating philosophy, but to the present reviewer that is

the weak point of his method. It is impossible to make the attitude of AL-GHAZZALI, for example, thoroughly intelligible without dealing with those of AVICENNA and AVERROES, as AQUINAS involves ABELARD and DUNS SCOTUS. And excluding philosophy excludes with it physical science, which would come under philosophy in a Moslem system of encyclopedia. All other activities, physical and mental, in the Moslem civilization fall under crafts, trades, occupations; a physician, for example, would be either a philosopher or a barber-surgeon; an architect would be a master-builder; any kind of artist would be a craftsman. This, of course, reminds us at once of medieval Europe and it may be said shortly that there was no break in medieval times between Islam and Christendom, each understood the other in a way that has never been possible since the renaissance.

But for the readers of this periodical the interest of GOLDZIHER'S book must lie in the light which it throws on the position of science, in the modern sense, in Islam. Of that there is no explicit treatment, but it is made very plain by the whole drift of development that science has never been, in any true sense, a permanent, self-continuing element in that civilization. Only exceptional individuals have been interested in science, and schools of science have flourished only under the protection of princely patrons. The flowering times of Baghdad, Cairo and Cordova were short and left no heirs. This is the real explanation of the puzzle of the impermanence of Moslem civilization. The university life of Islam turned steadily to theology and canon law and to their strictly ancillary disciplines. And these latter dwindled, through lack of independent life and interest, until philosophy became scholastic theology and astronomy became the art of constructing the ecclesiastical calendar. For fuller consideration of this primary historical fact I venture to refer to my paper of sixteen years ago, read before the St.-Louis International Congress and printed in its Proceedings. Of course, there were from time to time individuals interested in all the facts of the world. But they were few. AL-BERUNI stands almost alone in objective consideration of the non-Moslem world. The professed « philosophers » — of various phases of the neo-Platonic Aristotelian amalgam — either enjoyed princely protection or camouflaged themselves, sincerely or insincerely, with mysticism, or else externally « conformed », confiding their real views to their own students. It is significant how early it was that Islam developed the idea of an economy of teaching, that truth must be different for different classes of minds, which led to the twofold truth of the European Averroists. In Islam truth was admittedly manifold, and some orthodox theologians were driven — between philosophy and dogmatics — to a doctrine practically that of the different classes

of « judgments » of our own day. But all these were isolated cases and it was only in the mystical schools that free speculation continued in any measure to flourish, with tendencies even there toward crystallizing into barren scholasticism.

The end could not be doubtful. Theology was not only the queen of the sciences; it came to reign alone and, so doing, became sterile. Such sciences as, through the ineradicable vitality of the human mind, survived, took forms which could relate themselves to theology — magic, astrology, alchemy. They could thus justify their existence by an assertion of usefulness. For the intellectual life of Islam had passed under the ban of utilitarianism. However excellently science in the abstract might be praised, the sciences were always divided into the praiseworthy and the blameworthy, and the blameworthy were those which could not give a useful reason for their existence; useful, that is, for man's life in this world or for his future salvation. Anything else man had better leave alone, even if there were nothing especially hurtful in it. A universally accepted and much quoted tradition from the Prophet is adduced in support of this position. « It is part of the beauty of the Islam of a man that he should leave alone that which does not concern him. » Under this ruling the pure sciences cannot be cultivated and only the applied sciences are possible, a position amply sufficient in itself to explain the decadence of Islam. And it must not be thought that this was the position of theologians and ethicists only. Ibn Khaldun, the Berber, who died A. D. 1406, while not technically a man of science like Al-Beruni, has left us, in his *Prolegomena to History*, a most open-eyed and intelligent picture of the whole Moslem civilization of his time, applying to it a very acute psychological and historical analysis. His book is unique in Arabic and he was evidently deeply interested, in the modern sense, in all the phenomona of life. But this apparently unconscious attitude and practice of his were contrary to his explicit teaching, for, in at least two places in his book (De Slane's *transl.*, III, p. 185 f., 285 f., Quatremère's text, III, p. 135 f., 258 f.), he lays down the position stated above and quotes in support of it the tradition.

Nothing of this will strictly be found in Goldziher's book; but its reader will easily see there within what narrow bounds the normal intellectual life of Islam was permitted to move, and will understand Heinrich Ritter's dictum that the ingenious but fantastic atomic scheme of the Moslem scholastic theologians is Islam's most characteristic and original contribution to the history of philosophy and not the derivative comments and supercomments of the Arabic-writing Aristotelians and neo-Platonists.

Duncan B. Macdonald.

Julius Ruska. — **Zur ältesten arabischen Algebra und Rechenkunst, in** *Sitzungsberichte der Heidelberger Akademie der Wissenschaften, Philosophisch-historische Klasse*, p. 1-125, 1917.

This work by RUSKA and the work of SUTER on the astronomical tables (1) of AL-KHOWARIZMI are certainly the most noteworthy contributions to the history of medieval Arabic science, made within the past decade. Both occupy themselves with the achievements of the great Arabic mathematician, astronomer, and geographer, MOHAMMED IBN MUSA AL-KHOWARIZMI, whose contributions to elementary arithmetic, algebra, and trigonometry are fundamental in the development of these subjects, directly influencing nomenclature and methods for seven centuries and exerting influence even to the present day. AL-KHOWARIZMI's contributions to astronomy and geography were equally important in the development of these subjects among the Arabs.

The discussion of the Arabic terminology and the Latin and English translations of AL-KHOWARZIMI's *Algebra* by RUSKA throws new light upon the whole subject from the point of view of modern Arabic philology, the first adequate treatment of this subject. At the same time RUSKA discusses various questions touching the development of mathematical ideas in a scholarly manner. While here and there one may disagree with the conclusions drawn by RUSKA one cannot deny that the historical and philological facts involved are clearly presented by one who is a master of Arabic and of philological method as applied to historical problems.

The twelve sub-divisions of RUSKA's work have the following titles:

I. The title of MOHAMMED BEN MUSA's algebra.
II. The Liber augmenti et diminutiones and the Kitab al ǧam' wal-tafrīk.
III. The Regula Sermonis.
IV. Content of M. b. M. 's algebra and treatment of its sources from COSSALI to CANTOR.
V. On the history of the Arabic numeration (names of numbers).
VI. On the Inheritance problems in M. b. M. 's algebra and the original application of the terms, *mal* and *schai*.

---

(1) Die astronomischen Tafeln des MUḤAMMED IBN MŪSĀ AL-KHWARIZMĪ in der Bearbeitung des Maslama IBN AḤMED AL-MADJRITI und der latein. Uebersetzung des ATHELARD VON BATH auf Grund der Vorarbeiten von A. BJÖRNBO und R. BESTHORN in Kopenhagen, herausgegeben und kommentiert von H. SUTER, Zürich. *Mémoires de l'Académie Royale des Sciences et des Lettres de Danemark*, Copenhagen, 7me Serie, Section des Lettres, vol. III, 1914.

VII. The terminology of the qûadratic equations.
VIII. On the development of the number system.
IX. The names of the Arabic numerals.
X. The chapter on mercantile problems.
XI. Concerning the chapter on measurement.
XII. M. b. M. 's Algebra as a part of his total scholarly achievement.

So far as the title (*ḥisab alġabr walmuḳābalah*) is concerned, RUSKA shows that ROSEN is extremely careless and unscientific in his English translation of the two terms involving the idea of restoration or completion (*alġabr*) and of reduction or comparison (*almuḳābalah*). Both terms are carefully explained by AL-KHOWARIZMI in connection with algebraic problems. When the Arab arrives at the equation

$$10x - x^2 = 21$$

he conceives of $10x$ as being incomplete by the amount x^2 which he « completes » with x^2, arriving at $10x = 21 + x^2$; the word used for « completes » is a verb formed from the same stem as *ġabr* (*alġabr*). When the Arab arrives at an equation $50 + x^2 = 29 + 10x$, he « reduces » by casting out 29 from the 50, arriving at $21 + x^2 = 10x$; the verb used for « reduces » here is from the same stem as *mukābalah*.

The precise and literal translations of selected passages of AL-KHOWARIZMI's algebra and of other Arabic works constitute a noteworthy part of RUSKA's contribution to our knowledge of Arabic mathematical science. The discussion of the medieval Latin translation published by LIBRI, probably due to GERARD of CREMONA, shows that this translation was carefully made by one who had a keen perception of the niceties of the Arabic language; this directly controverts the statements which have frequently been made from the time of ROGER BACON down maligning the whole group of translators of the eleventh and twelfth centuries. ROSEN's translation is shown repeatedly to be inferior in interpretation of Arabic terminology to the Latin translation. In fact RUSKA shows that the Latin translation of the LIBRI text was based upon a better Arabic text than the one used by ROSEN. So far as the terms for x and x^2 are concerned, ROBERT OF CHESTER uses « radix » and « substantia » throughout the preliminary discussion, but in the problems changes to « res » and « substantia ». The fact that the second power of the unknown was considered almost as a second unknown is well illustrated by the text of ABU KAMIL who solves geometrically, as I have shown (The algebra of ABU KAMIL, *Bibl. Math.*, v. 12, p. 40-55, 1912), not only for « radix » but also for « census »; in this he was followed by AL-KARKHI. Any consistent symbolism was not found until the time of VIETA.

RUSKA calls attention properly to the importance of the neglected

portions of AL-KHOWARIZMI's work, those dealing with the inheritance problems and with mensuration problems. On the Hindu source of many of the algebraical, arithmetical and geometrical ideas involved in this work, RUSKA throws new light, while at the same time he points out the particular contributions of the Arabs as a race, and of the author AL-KHOWARIZMI as an individual. In particular the definite Hindu character of the chapter on mercantile transactions is clearly demonstrated on the basis of material in ARYABHATTA, BRAHMAGUPTA and BHASKARA; similarly with the work on mensuration, including the approximate formulas for the length of circular arcs, and areas of the segments.

To one point of view taken by RUSKA (p. 48) serious exception can be made. To assert that the practical uses of computations in daily affairs was the occasion of the extension and development of either arithmetic or algebra is as unwarranted a deduction as the assertion, repeated since the time of HERODOTUS, that geometry owes its origin to the measurement of land. The necessity for these developments is intellectual. The demands of the commercial life of Greece had no part in the progress of Greek science, nor were the scientific developments of the Arabs dependent upon commercial needs. It must be admitted, of course, that the Hindus and the Arabs, like the Egyptians, had a keener sense than the Greeks for application of science to affairs, but this was primarily by way of popularization rather than as source of development.

In passing should be mentioned RUSKA's article : « Neue Bausteine zur Geschichte der arabischen Geographie[1] » in which is emphasized the importance of AL-KHOWARIZMI's contribution to early map-making. AL-KHOWARIZMI's « surat alard » was the text accompanying a world map, much improved by Arabic geographers over PTOLEMY's map. The manuscript of this geographical work appears to be in Strassburg, having been found in Cairo in 1878 by W. SPITTA[2]. Later NALLINO[3] and more recently HANS V. MZIK[4] have given further information

---

[1] *Geographische Zeitschrift*, Vol. 24, 1918, p. 77-81; RUSKA here inadvertently speaks of the author as ABŪ GA'FAR M. B. M., instead of ABŪ ABDALLAH M. B. M.

[2] W. SPITTA. Ḫuwarazmi's Auszug aus der Geographie des Ptolemaeus, *Zeitschrift Deutschen Morgenl. Gesell.*, vol. 33, 1879.

[3] NALLINO, AL-Ḫuwārizmi e il suo rifacimento della Geografia di Tolomeo, *Atti della R. Accad. dei Lincei*, Anno 291, Serie V, *Memorie, Classe di Sc. Mor.*, Vol. II, Rome, 1896.

[4] HANSV. MZIK, PTOLEMAEUS und die Karten der arabischen Geographen, *Mitteil. d. k. k. Geogr. Ges. in Wien*, Vol. 58, 1915, p. 152; Afrika nach der arabischen Bearbeitung der γεωγραφικὴ ὑφήγησις des CL. PTOLEMAEUS von MUḤ. IBN MŪSA AL-Ḫwarizmi, *Denkschriften d. Akad. d. Wissen. in Wien, Phil.-hist. Kl.*, Vol. 59, 1916.

concerning the work, and V. Mzik has reconstructed the map of Africa.

Ruska has thrown light upon a series of difficult problems in connection with Arabic science. The Arabic contributions to Western civilization touch vitally many different fields. Their direct and indirect contributions to navigation and discovery in the fifteenth and preceding centuries has never received adequate appreciation. A work like this by Ruska deeply concerns the whole intellectual history of medieval Europe, as modern historians of this period are beginning to realize.

(University of Michigan.) Louis C. Karpinski.

T. Endō, *History of Japanese mathematics*, revised and enlarged (in Japanese). With notes by Mikami, Okamoto and Ōtani and with a biography of the author by Mikami, 702 p. Tokyo, 1918.

Mr. Endō was a zealous student of the history of Japanese mathematics. He began his studies in this direction in 1878 and published the results of his research in 1896 in a work entitled *History of Japanese Mathematics*. He devoted his time to revising and enlarging this work from then on, until 1915, when he died at the age of 72. Under the direction of the late Baron Kikuchi his manuscripts were set in order by Y. Mikami, N. Okamoto and R. Ōtani, whose notes are recorded in the margin of the book. The resulting work is twice as large as the original publication.

Mr. Endō divides the history of Japanese mathematics into four periods :

The first period : Primitive Japanese age, about which almost nothing is known.

The second period : beginning with the VIIth century A. D., when Chinese arithmetic was introduced and learned in Japan. There are few records concerning this age. In later times the Japanese forgot their previous knowledge.

The third period : which includes the beginning of the Edo Era, or the XVIIth century, during which Chinese works were learned for the second time. The Japanese were soon to advance in their own mode of learning.

The fourth period : beginning with the appearance, about 1675 of Seki Kōwa. His achievements are highly Japanese in character, most of them not appearing in previous Chinese works. His disciples, both direct and indirect, advanced still further. The establishment of the *endan* and *tenzan* algebra and of the circle-principle is most noteworthy of this period.

The fifth period beginning with AJIMA's revision of the circle-principle, and ending with the organization of the *Sūgaku Kaisha* — Mathematical Society — in 1877. The Restoration of 1868 forms a distinct break in the history of Japanese mathematics, after which scholars take up European mathematics principally, and postpone the older native science. For a while, however, the latter struggled desperately for existence. The newly founded association was composed of members of both parties, between whom there sometimes arose bitter enmity. The older science rapidly lost ground. Mr. ENDŌ does not describe these matters, although he has himself been present at the very scene of the struggle. Nor does he give any account of the native mathematics which followed. Characteristic of this fifth period is the treatment of various problems leading to double or multiple integration. Various other interesting problems, mostly of a geometrical nature, were also handled and solved.

Mr. ENDŌ gives his account in chronological order. He is very remarkable for the richness of his materials, in the compilation of which he was exceedingly painstaking. It is to be regretted, however, that he has, as a rule, failed to record his sources of reference. He is sometimes not discriminating in his judgments. The weakest point of the work lies in the author's utter ignorance of Chinese mathematics.

Mr. ENDŌ writes as follows :

The publication of YOSHIDA's treatise of 1627 was of great value for the progress of Japanese mathematics. Some time later, the abacus algebra of the Chinese became known in Japan. Though the authorities did not support the pursuit of this science, individuals among the people were eager for its advancement. SEKI now appeared on the scene. He established the written algebra of true Japanese form, which developed from the Chinese abacus algebra. He and his disciples made various discoveries. There arose several rival schools. Since crafty men would sometimes learn of the achievements of others and publish them as their own, it became necessary to keep discoveries secret. In SEKI's school the highest diploma was given only to two persons, an act which has certainly proved detrimental to the natural growth of the science. It was customary, in the enemy schools, moreover, to disregard the art of mensuration. The FUJITA-AIDA controversy uselessly exhausted the effort of students. Because the stream of progress was now flowing in vigorous torrents, however, the discussion retarded it to no great extent. Various mathematicians vied with one another, and their happy emulation resulted in many discoveries.

In the latter half of the XVIIIth century, the problems of inscribed figures were mainly studied. Since there were soon no new problems

of this kind, the mathematicians strove to excel each other in their skilful treatment of old problems. Successive improvements upon the rules of solution given by previous writers ensued. As, however, there was no knowledge of geometry in Japan, the scholars found difficulty in selecting new, interesting problems. The barrenness in physical sciences was also highly detrimental to the progress of Japanese mathematics. But in the domain of the circle-principle, after the improvements of AJIMA and WADA, science was wonderfully developed in a way quite incomparable to that of former times. The solution of complicated problems became a simple matter. This progress has resulted entirely from the efforts of private individuals.

As to the contents of the work, it cannot easily be told in brief, because the subjects are arranged in chronological order and are very numerous.

(Tokyo) YOSHIO MIKAMI

Science in Japan (in Japanese). By the Japan Civilization Society. XXI+415 p. Tokyo. 1917.

Histories of special sciences in Japan have occasionally been written, as, for example, FUJIKAWA's History of Japanese Medicine, ENDŌ's History of Japanese Mathematics, etc.; but the treatise before us is the sole one that considers the entire subject of Japanese science, as a whole, in a single volume. We regret only that the name of its author is withheld. Though the work treats of the development of science in Japan from oldest times, it is professed that the Meiji Era, or the latest growth, is mainly considered. For this purpose the book is divided into three parts:

1. Oriental sciences studied and completed in Japan (p. 1-116);
2. Introduction and spreading of European learning (p. 117-215);
3. Science in the Meiji Era (p. 217-415).

This scheme shows that the work is quite different from those of FUJIKAWA and ENDŌ, who considered mostly or wholly the old Japanese science. In some parts it undoubtedly follows the plan of Marquis OKUMA's History of the Fifteen Years of the Opening of the Country.

In the opening chapter the nature of Japanese civilization is discussed. Though some consider it to be wholly imitative, the author does not admit it. He maintains that it is assimilative. Japan was not content with base imitation of Chinese and Hindoo civilizations, nor did she remain on a lower level than these. Confucianism and Buddhism as developed in Japan prove this clearly. Japan's assimilation of Occidental civilization during the last half-century has been brought about in a manner similar to those of former times when she came in contact

with the civilization of China and of India. Thus does Japan devour and digest the civilizations of other peoples.

Medicine early developed in Japan, being influenced first by Indian and then by Chinese art. Some treatises on medicine were early written, marking the progress of medicine in advance of other branches of knowledge. In modern times medical men have sometimes been in advance of philosophers in matters of thought. It is thus shown that medicine has always held a most important place in the progress of Japanese learning. Natural history is an outgrowth of medicine. In describing the progress of medical science the author appears in the main to be following Dr. FUJIKAWA's great work.

Mathematics is considered in regard to the causes of its progress. These are presented as follows:

1. Arithmetic being generally known to the people;
2. Establishment of the astronomical board by the Shogunate;
3. Establishment of astronomical boards and of mathematical schools by local feudal authorities;
4. Love for learning and willing instruction;
5. A succession of proposals of problems and their solutions;
6. Suspension of arithmetical tablets before the temples.

I have myself discussed the same problem in the *Shigaku Zasshi*. The author in the main accounts for ENDŌ's opinion. He considers the existence of rival schools and the ensuing controversies as lamentable events in the history of science; but this may be considered otherwise, since these very events have, in a certain sense, undoubtedly been for the good of scientific progress.

In Japan astronomy flourished only as the art of calendrical regulations, of which this work gives only a short sketch, without going into a discussion of its development. The progress of mathematics among the people fortunately brought about the calendar reform, after a long interval of retrogression. Physics and chemistry were practically unknown in Japan until after the influence of Europe.

The progress of industry is briefly considered, but nothing is said of its relation to the development of science.

The introduction of Western learning began when the Portuguese brought in the gun. The Christian missionaries, who soon after visited Japan, sometimes practiced medicine. It was thus that the Portuguese knowledge of medicine prevailed over the older art. The Dutch in subsequent years brought with them the art of war and the science of medicine, two branches of learning which were most conspicuous among the Dutch sciences learned by the Japanese. Its superiority in the knowledge of anatomy has largely contributed to the adoption of Dutch learning in Japan, since the older knowledge of the

Japanese on the subject had been of a very meagre kind. It was in 1771 that the first Dutch anatomical treatise was translated in Japan. SIEBOLDT's visit to Japan proved of advantage in spreading Dutch science. It reacted upon older Japanese science in such a way as to invigorate the spirit of the advocates of the latter. There ensued therefore a rivalry between the two parties. In the end, however, the Shogunate founded a school were Dutch medicine was taught. The medical men of the Dutch school were quick to learn, in addition to their special subjects, politics, gunnery, military science, fortress construction, etc., etc., becoming in consequence, the leaders in the propagation of this newly come civilization. The influence of these studies has in no small degree brought about the opening of the country for foreign intercourse. The need of building ships and organizing new armies was so keenly felt by the feudal lords of ministerial rank that men were sent to Holland to learn modern methods. Medical students were also sent there. The necessity of competing with foreign powers was the cause of this general advance, which resulted in the political change of government called the « Restoration ».

After the Restoration of 1868 the importation of Occidental knowledge was conducted on a larger scale and with determined hand. In the earlier periods of seclusion, the old classics had been most revered; now the positive sciences were brought to the fore. A splendid scheme of school education was planned, and was satisfactorily carried out.

The two decades following the Restoration were spent in adopting the foreign sciences, special education being conducted mainly by foreign professors Thereafter the Japanese were able to assimilate what they had learned from abroad. Gradually native scholars began to appear, replacing by degrees their foreign masters. During the course of this development, the art of medicine was in the lead, and consequently medical institutes were made foremost in the university system of Japan. All the various branches of sciences, however, were taught and learned to some extent.

It must be noted that scientific education was not at first brought into intimate contact with practical life. In the latter domain capitalists and courtisans were used to carry out their functions under the guidance of foreign engineers. This state of affairs has long held the public from paying reverence to science and to scientists. The progress of education, however, did gradually send forth educated engineers into society, and scientists of some merit gradually advanced in their achievements. The outbreak of the great war was of great benefit to the progress of science in Japan, since the public was compelled by circumstances to recognize the usefulness of science.

Y. MIKAMI

Y. Mikami. — **The causes of the development of mathematics in Japan,** The *Shigaku Zasshi*, vol. 29, n° 3.

The flourishing age of old Japanese mathematics covers the entire period of the Tokugawa Shogunate. Its development is due first to the introduction of Chinese mathematics, CH'ENG's work of 1593 and CHU's work of 1299 being mainly studied. Practical need also induced its development, for the time had come when a knowledge of mathematics was required in land survey, large fortifications, irrigation work, etc., etc. The improvement of social conditions was a further influence. Economic development, greater leisure, ineffectualness of religious restrictions, increasing self-consciousness, all these proved of importance for the development of mathematics as well as for the general progress of civilization.

The Japanese remoulded the mathematical knowledge which they received from China, for, as will appear in the case of art and architecture, Buddhism, philosophy, etc., remoulding was the usual outcome of Japanese civilization.

The best example of mathematical remoulding will be seen in the development of written algebra from the abacus algebra of the Chinese. In this, the Dutch influence is insignificant. The Japanese notation of algebra was the natural outgrowth of the method of recording algebraical representations by calculating rods which was used by the Chinese. The use of these rods had directly influenced the development of Chinese mathematics, and continued to work indirectly upon the progress of Japanese mathematics.

The *soroban* also had great influence. Although calculating rods could be used for higher numerical equations, yet their actual application was so cumbersome that the Japanese always preferred the *soroban*, which proves very convenient in practice, and endeavored to devise some treatment of problems by which this dexterous abacus could be used in solving them. As a result certain methods of infinite expansions and repeated approximations were established.

Japanese mathematics contains much that is of no practical value. Most of their problems were non-practical in nature. The Japanese studied mathematics principally for the sake of enjoyment. Tablets presenting mathematical problems together with their solutions were often suspended before the temples — a practice which shows that mathematics was considered as a form of art. Although the art of mensuration was held in very low esteem by the Samurai class, yet even some members of the feudal lords' class and of other ranks had a taste for mathematics. They studied it despite the mockery of their friends, as if it were a form of pastime. In most cases they could earn

nothing from their knowledge of mathematics, since there was little opportunity to gain a livelihood as a professional mathematician. Exceptions were extremely rare.

The problems considered in Japan are very numerous, but they may be classified under a small number of headings. Most of them differ from those that accompanied the first rise of Japanese mathematics. The methods of solving them also differ. Japanese mathematics was not rich in principles and methods, but in the practical exercise of the few which they possessed the Japanese were very skilful. The same fact holds true in the case of the fine arts and of the art of war.

In Japanese mathematics, methods of demonstration were not fully developed. The Japanese often preferred incomplete induction, or inference from numerical values. Geometry as a demonstrative system had no place in Japan. Japanese mathematics is full of erroneous results.

Complicated problems were at first prevalent, but after a time simplifications set in. The passing of time has brought a gradual theoretization of mathematics. European influence is quite undeniable, and appears in the use of trigonometry, logarithms, problems on the centre of gravity, etc., yet the whole structure of Japanese mathematics was never shattered during the entire period of foreign influence. The case is quite different from those of astronomy and calendrical art, into which the European system was introduced.

Y. MIKAMI.

Y. Mikami. — *Magic squares in Japanese mathematics* (in Japanese), IV + 174 p. Tokyo, Imperial Academy of Science, 1917.

The Japanese mathematicians were fond of artistic considerations of non-practical problems. One kind was that of magic squares, concerning which there are numerous documents. This subject was, of course, introduced from China, the works of YANG HUI and CHU SHIH-CHIEH, who flourished in the XIIIth century, being the earliest treatises that contain examples of magic squares. These works were brought to Japan. YANG's work, indeed, in which magic squares are considered, was lost in China. YANG's and CHU's magic squares are similar.

There are several printed works in Japan of the XVIIth century, in which examples of magic squares are given. ISOMURA (1660), MURAMATSU (1663), SATŌ (1666) and HOSHINO (1672) are the authors of these works. In a written work of 1683, SEKI treated the subject of constructing one form of magic squares. ANDŌ treats another way of

constructing magic squares in a printed work bearing the dates 1694 and 1695. ANDŌ says that he has learned his method of consideration from SHIMADA, in 1653, a date which is the oldest in Japan that bears upon the matter. The contemporary of SEKI and ANDŌ, TANAKA, discussed in a manuscript treatise the construction of magic squares, according to which consideration many different arrangements may be obtained. His work bears the date of 1683.

SEKI's disciples, TAKEBE, MATSUNAGA and AOYAMA wrote several manuscripts, in which they considered new methods of constructing magic squares. KURUSHIMA's way is very interesting. Heretofore, during SEKI's time, layer after layer of a magic square were successively arranged; now a different mode of procedure was adopted.

When the methods of construction had advanced to this point, there arose an attempt to enumerate the different magic squares which may be constructed. YAMAJI was perhaps the first mathematician to enter this field. He tried to give the number of all 5-squares which may be arranged according to SEKI's method. A few anonymous manuscripts refer to similar treatments. After YAMAJI's time there appeared several mathematicians to carry out the same scheme.

Toward the close of the old Japanese school of mathematics, new attempts of constructing methods were made by ICHIKAWA, GOKAI and others.

These subjects are treated under thirty-four separate heads. Prof. T. HAYASHI published a comment on the work in the *Tokyo Butsuri Gakko Zasshi*, No. 312, 1917. He adds something very interesting about TANAKA's work of 1683, based upon a better manuscript of it.

Y. MIKAMI.

S. Kanetsune. *Music in Japan* (in Japanese). Tokyo, 1912. — **H. Tanabe.** *Lectures on Japanese music* (in Japanese). Tokyo, 1919.

Because these two works contain many facts of interest to students of the history of science, something of their contents is here given.

The music of the Japanese, though first introduced from China, was ultimately destined to be remoulded to suit their own taste. The musics of the two nations are fundamentally different from each other, being reflections of their respective national characters. The Chinese had held music in high esteem from remotest times, as will be seen from the use of the term *li-yüeh*, — « institutions and music ». There is no wonder, therefore, that the Chinese have made extraordinary

progress in music. They early considered the theories of music, some accounts of which are found scattered in the older classical works. But the *Shih-chi* (Historical Records) and the *Huai-nan Tsŭ* are the oldest works remaining extant in which a full treatment of the subject appears, both belonging to the first century B. C. In these works the musical scale is considered to be formed by a method called the increase and decrease of one-third of the length of a given musical tube. Thus twelve tubes are obtained which give a scale of twelve tones, in essence corresponding to PYTHAGORAS' scale. CHING FANG of the later HAN Dynasty applied the same method of treatment and found a scale of 60 tones, said to be essentially the same as BOSANQUET'S scale of 53 tones. Subsequently CH'IEN YÜEH-CHIH of the LIU-SUNG Dynasty obtained a scale of 300 tones, and CHÉN CHUNG of the L'IAN Dynasty, a scale of 360 tones. Thus the same way of treatment was followed for many hundreds of years, but at last, toward the close of the MING Dynasty, CHU TSAI-YÜ abandoned the method of taking one-third, and adopted one of taking a geometrical average, whereby he obtained a new system of twelve tones, which is equivalent to the twelve average intervals of the West. Mr. KANETSUNE discusses these matters at considerable length in his work, the separate topics of the subject having previously been treated in several articles in the *Tōyō Gakugei Zasshi* by Mr. TANABE and Prof. S. NAKAMURA.

There are two kinds of music, Mr. KANETSUNE says, the one being born music and the other constructed music. Chinese music belongs to the latter class, of which none is found in other Asiatic nations (p. 425). Thus in China the rules of harmony were obtained as results of scientific treatment, upon the actual applications of which there ensued the gigantic harmonical music of the SUI and T'ANG Dynasties (TANABE, p. 27). The musical instruments which were imported from China to Japan in those times are known to have been of highly developed kinds, some of them being provided with several tubes with tongues and small holes at and near their bottom, some with resonance boxes, some with chords whose lengths could be controlled at will by the finger. In the method of harmony with regard to the instrument called *shō*, the resolution of dissonant sounds was already adopted. Thus all the formal elements had been in existence and standing upon a firm scientific basis, and the mode of composition, also in wonderful progress, was already comparable to the subsequent development in Europe during the seventeenth and later centuries. The Chinese alone were able in those early ages to succeed in such a logical way with musical composition. Nevertheless Chinese music was preëminent only in its formal respect; as to its contents,

Indian music must be preferred. It is only since the YUEN Dynasty that the Chinese have begun to attach some importance to the contents of music, and that dramatic progress has been made. (TANABE, p. 96-129).

Since the Chinese are essentially a people given to reason, formal music of this kind has developed among them. But the Japanese are of an emotional disposition, so that the magnificent harmonical music imported from China has only undergone a kind of retrogression, being at last replaced by an emotional kind of music characteristic of the Japanese. In China even Confucianism was left much to the consideration of scholars in its formal or rationalistic aspect. In Japan, where theoretical treatments were little in favor, the practical application of the doctrines was better realized. (TANABE, p. 22-23).

TANABE divides the development of music in Japan into four stages, as follows :

The first or primitive period : There was no instrumental music; only some crude kinds of vocal music prevailed.

The second or Chinese period : when the formal music of China was introduced and cultivated. In the first half of the period, which lasts to the first half of the tenth century, only the court nobles struggled to imitate the Chinese mode of instrumentation. In the second half of the period, which comes toward the end of the court supremacy, or the twelfth century, the instruments brought in from China underwent some remoulding, and there arose a kind of vocal music in which harmony was inclined to be neglected. By and by the literal meaning of songs came to be stressed.

The third, or feudal period : Japan was now free from foreign influence, so that music was destined to make progress in a true Japanese way, and there appeared nothing but vocal music, which served only to express the senses of songs. This period is divided into three sub-periods :

A) *The Kamakura era.* (XIIth-XIVth centuries). — Now disappeared altogether the formal music of the preceding age. The local feudal warriors who had just come into power were so little educated that they needed a very primitive kind of music. But this era is important in the history of Japanese music as being an age of transition, during which music was being transformed into something dramatic and sensual.

B) *The Muromachi era* (XIVth-XVIth centuries). — Now, the Shogunate being opened in Kyoto, the feudal vassals were influenced by the formalistic, cultured atmosphere of the old imperial capital. Thus the music of this era becomes enveloped in a sort of formalism, although

its essence still lies in its dramatic contents. This may be a piece of contradiction. But the warriors' life was a contradiction in itself in those days, for they had to meet and congratulate even lamentable death with a smile. The so-called Bushidō, or warriors' morals, were merely emotional, and never explicable by dint of reason. The warriors were accustomed to support their emotions on the one hand and to suppress them on the other. In thus leading a contradicting life, they necessarily developed a form of music expressing this contradictory mood.

The Japanese, since they were not of a rationalistic turn of mind, were not able to appreciate a purely rational harmony. Melody, likewise, was not retained in the music of these simple-minded warriors. Time was the only element which was kept. Because music was to consist of this single element alone, the *yōkyoku* appeared, a form of music in which the organization of the time-element is wonderfully complicated and developed.

C) *The Edo era* (XVIIth-XIXth centuries). — Japanese music now becomes very variegated, the different classes of people having come into possession of typical sorts of music. But the most characteristic forms of this era were those that arose among the merchants and laborers, the aim of which was the expression of human sentiment, and the mode of execution of which was wonderfully developed. But these pieces of music are of little value without the Japanese words, and are utterly destitute of scientific basis. TANABE considers especially the *jōruri* as the most representative among them. Its development separates naturally into two stages, first at Ōsaka and then at Edo.

Ōsaka was a city that had long flourished and was open to trade, its merchants being wealthy and leisureful, and the surrounding territory having been long influenced by the old culture of the imperial capital. The merchant of Ōsaka was thus destined to introduce a new kind of music which embodies common-sense, is free and unconstrained by any theoretical considerations, and which expresses the internal conflicts of obligation and sentiment. The common-sense education of the Ōsaka merchants did not suffice, however, for the further development of the music thus brought into existence.

Now Edo becomes the centre of Japanese culture. Music too continues its development there. At first coarse kinds of music flourished, but there was soon transplanted to the Shogun's capital a sort of music which had originated in Kyoto. Because this ancient capital was now out of worldly activities, its music, too, was not of a lively character and lacked force of expression. The conventional colour of old times was, however, retained in some way, which gave it an esti-

mable character. This piece, when played at Edo, must discard all its conservative garments of Kyoto, and assume a new colour suitable to the newly established feudal capital. The artisans were now gaining the ascendency in the community of Edo. They were without education, and could not, therefore, understand the sense of sentiment, as had been the case in Ōsaka. They were generally poor and worked by the day, and so were keen in sentiment and inclined to strong impulses. In their music they cared little for form or style; they needed only that which pleases the ear or which satisfies the senses. The statements of songs thus became out of tune.

In the emotional music of Japan, the Chinese mode of harmonic scales was postponed, the scales being accounted for unaided by the eye. In consequence, there arose the so-called melodic scales. In the vulgar music of the Edo era the scales were freely arranged and regulated according to the moods which sentiment produced. As a result, the scales cannot be measured mathematically as in the case of Chinese music. In Japan no occasion arose for theories of music to make their appearance.

A kind of scale, of twelve tones, had, to be sure, unwittingly arisen in Japan, but it was of a kind utterly unknown in China, so that all efforts to explain it from the standpoint of Chinese musical theories failed. The mathematician NAKANE GENKEI was the only person in Japan who could give a rule for the Japanese scale of music. All this shows clearly that the Japanese, though skilled in the art of execution, had no ability whatsoever, as a theoretician; a fact in direct contrast with Chinese genius.

The fourth or modern period: the present age, during which Occidental music was introduced and continues to be studied. Nothing characteristic of the Japanese is as yet to be ascertained in connection with this lively and prosperous epoch.

The forms of music characteristic of the Japanese have all been vocal. One exception may be pointed out in the case of the *jiuta*, played with the accompanying instrumentation of the *koto*. This subject is treated in full by KANETSUNE. According to him, the *jiuta* consists of a series of fine phrases, the meaning of whose words is second in importance to the accompanying instrument. KANETSUNE, in discussing the source of this kind of music, accounts, first, for its place of origin having been the ancient city of Kyoto; second, for the use of the *koto*, which is suitable for independent instrumentation; and third, for the interest taken in this form of music by blind men, who prefer the sounds of songs to the senses of them. (KANETSUNE: p. 153-156).

(Tokyo.) YOSHIO MIKAMI.

Graesse, J. G. Th. — *Kunstgewerbliche Altertümer und Kuriositäten.* Führer für Sammler und Liebhaber von Gegenständen der Kleinkunst, von Antiquitäten sowie von Kuriositäten. Begründet von J. G. Th. Graesse, fortgeführt von F. Jaennicke. 6te Aufl., samt Zeittafel und Register bearbeitet von Franz M. Feldhaus, 262 S. Berlin, R. C. Schmidt, 1920.

The first ed. of this book appeared without any text in 1871 under the title *Guide de l'Amateur*; a second so-called « édition revue et augmentée », differing little from the first one, followed in 1877. The 3rd ed. entrusted to F. Jeannicke appeared in 1904 under its German title; this was really a new book; the 4th ed. dated 1909 was very similar to the 3rd one. The fifth (1916) and the present ed. were prepared by Feldhaus, who has made use of Thieme and Becker's *Künstlerlexikon* and of his own extensive material partly published in *Die Technik*, 1914. — This Guide is divided into 25 chapters each devoted to one of the arts or to a special kind of objects; *ex. gr.* Elfenbeinplastik; Glyptik; Eisenschnitt; Niello; Tula; Email; Glasmalerei; Uhren; Wandteppiche; Waffen; Brillen; etc. Each chapter contains a short historical summary, with more or less miscellaneous information, bibliographical notes and a chronological list of craftsmen. The chief feature, perhaps, is a large collection of craftsmen-marks and signatures (p. 221-258) — This book contains a large amount of information in very condensed form, and will prove useful to the collector and the antiquarian. Yet, there is still room in it for considerable improvement.

G. S.

Thomson J. Arthur. — *The System of Animate Nature.* The Gifford lectures delivered in the University of St.-Andrews in the years 1915 and 1916. 2 vol., xx + 687 p. London, Williams and Norgate, 1920.

« It has been declared by some that the world is a dismal cockpit, that in the behaviour of living creatures mind is a negligible quantity, that the study of heredity must leave us fatalistic and that evolution is largely a chapter of accidents. Such views engender what may be called natural irreligion and it is the object of this course to show that such views are scientifically untenable ». Part I. The realm of organisms as it is : (1) the unfathomed universe and the aim of science; (2) organic *vs.* inorganic nature; (3) criteria of livingness; (4) organism and mechanism; (5) uniqueness of life; (6) animal

behaviour; (7) the problem of body and mind; (8) the fact of beauty; (9) the issues of life; (10) adaptiveness and purposiveness. — Part II. The evolution of the field of organisms; (11) the concept of evolution; (12) great steps in organic evolution; (13) originative factors in evolution : variation; (14) directive factors in evolution : selection; (15) the individual and the race : heredity; (16) the evolution of mind and mind in evolution; (17) nature crowned in man; (18) disharmonies and other shadows; (19) the control of life : lessons of evolution; (20) *vis medicatrix naturae*. This very stimulating book, based on a sound knowledge of the relevant facts, is less a philosophy of biology than a general philosophy from the point of view of the biologist. Complete summaries of each chapter enable one familiar with the subject to follow and appreciate quickly the author's argumentation.

G. S.

Jaeger, F. M. — *Elementen en Atomen eens en thans*. Schetsen uit de ontwikkelingsgeschiedenis der elementenleer en atomistiek. 2de verbeterde druk, met 24 fig., 50 portr. en 1 kaartje, VIII + 312 blz. Groningen, Wolters, 1920,

F. M. JAEGER is professor at the University of Groningen, Netherlands and the author of a very remarkable book on the Principle of Symmetry (see *Isis*, IV, 32). The present book has been prepared as a textbook for Dutch students. Rather than to attempt to give in a little more than 300 p. a complete history of chemistry, JAEGER has wisely chosen to concentrate his attention upon the development of our notions on elements and atoms. Thus limited, the history is much simpler, and much more effective. The plan is as follows : (1) notions of elements in antiquity and in Asia; (2) elements and atoms as conceived by the Greeks before ARISTOTLE; (3) ARISTOTLE; (4) origin, form and propagation of alchemy; (5) iatrochemical and phlogistic periods; (6) atomism in the nineteenth century; (7) modern ideas; unity of matter; (8) index. The last chapter on contemporary science is very full (p. 210-281), and will enable the reader to have a very complete view of the development of chemistry, almost to our own days. The author has taken great pains to go back to the sources whenever possible. The footnotes contain much bibliographical information, and there are many well chosen illustrations. For other historical studies by the same author, (see *Isis* IV, 50).

G. S.

M. Delacre. — *Histoire de la Chimie*, XVI + 632 p. (140 × 225), Paris, GAUTHIER-VILLARS & C^ie^, 1920.

[Sans indication de prix.]

Cet ouvrage est « un livre de combat », nous dit l'auteur dans sa préface. Comme tel, et malgré sa documentation, il ne peut prétendre être une histoire de la chimie. Et en fait, il constitue surtout une charge à fond contre les hypothèses, les idées théoriques que l'auteur était tenu d'enseigner dans sa chaire de l'Université de Gand, et pour lesquelles cet enseignement lui a donné, dit-il, « une irrémédiable aversion ».

Niera-t-on cependant, pour ne prendre qu'un exemple, que la relation réciproque des notions d'oxydation et de réduction ait été pour la première fois éclaircie par la théorie du phlogistique, que des expérimentateurs aussi habiles que PRIESTLEY et SCHEELE ont acceptée pendant toute leur vie?

Certes, la science n'est pas l'étude des hypothèses, elle doit être l'étude de la réalité, des sensations, mais, comme l'a fortement marqué JEAN PERRIN, « à condition d'adjoindre aux sensations actuelles toutes les sensations possibles ».

M. DELACRE est trop foncièrement « chimiste » pour être historien. Il considère la chimie comme une entité, pourrait-on dire, et nulle part ne s'inquiète du mouvement des idées dans les autres sciences, ni dans la philosophie. Il eût cependant été particulièrement important de le faire pour ceux qu'il appelle avec mépris les Professeurs de 1860.

Nous avons ici une histoire des faits bruts, appuyée sur des textes, mais non l'histoire de leur genèse.

Et même, avons-nous vraiment l'histoire des faits bruts? L'attitude combative de l'auteur permet d'affirmer le contraire. La phrase suivante, par laquelle sont jugées les synthèses de carbures d'hydrogène, de BERTHELOT, est assez représentative : « Que valent *pour l'époque* ces synthèses de carbures? Ce sont trop souvent des réactions brutales, à rendements infimes, et qui ont perdu *aujourd'hui* tout intérêt. » (non souligné dans le texte, p. 569.)

Enfin, cette citation de la dernière phrase du dernier chapitre en dit long sur un certain état d'esprit dont n'a pas pu se défaire l'auteur. « Mais il nous paraît certain qu'on jugera que tous les FISCHER du monde ne viennent pas, tous ensemble, à la cheville d'un PASTEUR ou d'un DEVILLE. » C'est là du nationalisme, et non de l'histoire de la chimie.

L. GUINET.

Baddeley, John F. — Russia, Mongolia, China, being some record of the relations between them from the beginning of the XVIIth century to the death of the Tsar ALEXEI MIKHAILOVICH (A.D. 1602-1676). Rendered mainly in the form of Narratives dictated or written by the Envoys sent by the Russian Tsars, or their Voevodas in Siberia to the Kalmuk and Mongol Khans and Princes; and to the Emperors of China. With introductions, historical and geographical also a series of maps showing the progress of geographical knowledge in regard to Northern Asia during the XVIth, XVIIth and early XVIIIth centuries, the texts taken more especially from manuscripts in the Moscow Foreign Office Archives, 2 vol. in folio, 16 + CCCLXVI p., 22 maps and 3 plates printed separately, illustr. in text and genealogical tables; XII + 448 p., 3 pl. and 5 maps printed separately and other illustr. London, MACMILLAN, 1919. [Only 250 copies at 12 guineas each.]

This important publication offers us the results of research carried on by Mr. JOHN F. BADDELEY during eight years and it embodies the experience of many more. It developed in an unusual way. The second volume was written and printed first; it was in type before the war; the index to both volumes appears at the end of vol. I. This is simply due to the fact that after having edited the texts which fill the second volume, the editor realized the necessity of adding historical and geographical introductions. These introductions grew as his enquiries advanced and they make up the greatest part of vol. I. Historians of science will take special interest in the geographical introduction of which I will speak presently.

Volume the second contains the English translation of a series of narratives written or dictated by Russian envoys in Mongolia and China. Most of these narratives have not been published before except in Russian; some have not even been published in Russian and of these the Russian text is given in vol. I (except in the case of the TUKHACHEVSKY's Mission, 1634-1635, the Russian text of which was mislaid by the editor). The earliest text published, relating to an expedition to and beyond the Yenesei in 1602-1609, no longer exists in Russian and is known only through a Dutch translation by ISAAC MASSA published by HESSEL GERRITZOON, Amsterdam, 1612, together with other information, in a small volume entitled : *Beschrijvinghe vander Samoyeden Landt in Tartarien* (1)... Many other

(1) Speaking of this book, Mr. BADDELEY says (vol. II, p. 1) « that no other ever presented in so small a space so much new, varied and important geographical information. »

seventeenth century texts are published in full — too many to be quoted here, all the necessary elucidations being given in the footnotes or in appendixes. These texts will help to explain the history of Russian expansion in the East, and also the development of our geographical and ethnographic knowledge of Northern Asia.

In the historical introduction (96 p.) an endeavour is made to explain the development of N. Asia from the earliest times down to the beginning of the seventeenth century. This history is divided into three parts : Before the Mongol Invasion; The Invasion; After the Invasion. Special chapters are devoted to : Mongols and Kalmuks; VASILI II to YERMAK, with notices of HERBERSTEIN, MENDEZ PINTO and JENKINSON; YERMAK (d. 1585); Lamaism; The State of Affairs in N. Asia c. A. D. 1600. Two interesting notes complete this historical survey. One is a brief history of the Settlement of Siberia (1586 to 1718), the other deals with sables. Let me quote a few lines of SPATHARY; they attest in a picturesque way to the immense importance which these furs had taken in ancient times « Now the Sable is a beast full marvellous and prolific, and it is found nowhere else in the world but in Northern Siberia... a merry little beast it is, and a beautiful : and its beauty comes to it with the snow, just as with the snow it disappears. And this is the beast that the ancient Greeks and the Romans called the Golden Fleece ».

For us the most interesting part of the book is the Geographical Introduction (119 p.) which retraces the whole development of our knowledge of N. Asia, special emphasis being laid on the maps. The most important of the ancient maps are minutely described and analyzed, critically compared and splendidly reproduced. One cannot praise Mr. EMERY WALKER too much for these excellent reproductions. It is worth while to quote the maps examined by the author.

A first chapter takes us rapidly from the earliest times to the GODUNOFF map. These earliest maps are not reproduced, but the information which they offer on N. Asia is briefly analysed. After a few short paragraphs devoted to antiquity, the Dark Ages, the Orient and the early relations between South Russia and Siberia (relations clearly proved by the analogies between Siberian and Scythian art), Mr. BADDELEY considers successively the following maps :

EDRISI, 1154; MARINO SANUTO, 1320; DULCERT (? DALORTO) 1339; PIZZIGANI, 1367; Catalan Map, 1375; Borgian Map, ca. 1410; LEARDUS, 1442, 1448; FRA MAURO, 1459; BEHAIM, 1492; WALDSEEMÖLLER, 1516; AGNESE, ?1525; WIED, 1542; HERBERSTEIN, 1546; JENKINSON, 1562; MERCATOR, 1538, 1569; ISAAC MASSA, 1612; GERRITSZOON 1613; SANSON, 1650, 1654. The total result of this analysis (vol. I, p. CXI), is

« that practically the whole of the information added to European maps of Middle and Northern Asia from PTOLEMY to the second half of the seventeenth century, came from EDRISI, MARCO POLO, WIED. HERBERSTEIN, JENKINSON and MASSA... This information, such as it was, left all Asia north of the old silk-traders' route and east of the Ob, speaking broadly, as unknown as the reverse of the moon. So that it remained for the Russians in their clumsy, ignorant, rule-of thumb way, and one zealous Dutchman, NICOLAAS WITSEN, to throw light for the first time on those vast regions... »

The author now proceeds to examine very carefully the following maps :

1525 BATTISTA AGNESE. Map of Russia. Reproduced.

1562 JENKINSON.

1570 ABRAHAM ORTELIUS, Tartariae sive Magni Chami regni typus (*in Theatrum Orbis Terrarum*). Reproduced.

1657 JAN JANSSON. Tartaria sive Magni Chami Imperium (*in Atlas Novus*..., Amsterdam). Reproduced.

1667 The GODUNOFF Map. The original being lost, it is only known through different copies. A copy made by the Swedish envoy to Russia, FRITZ CRONMAN (or KRONEMAN) in 1669, is reproduced; a Russian version of 1672 (?) and another Swedish version of 1674 are also reproduced and discussed

1673 Ethnographical Map of Northern Asia (REMEZOFF Atlas, sheet no. 23/25). Reproduced.

1690-1693 SCHLEISSING's Map. Another version of the GODUNOFF map of little value. Reproduced.

1692 Le R. P. AVRIL. Nouvelle carte de la Sibérie et du Kitay ... tirée de l'original de la chancellerie de Moscou. Reproduced and discussed in vol. II, p. 215 sq.

1687 NICOLAES CORNELISZOON WITSEN (1641-1717). This map is discussed and compared with that of STRAHLENBERG (1730) and with modern maps (see synthetic sketch map). « On the whole, WITSEN's map, with all its shortcomings, marks the most important addition ever made at one time to the cartographical knowledge of Northern Asia. »

1696-1701 The REMEZOFF maps. (The original atlas, manuscript, is in the RUMIANTSEFF Museum, Moscow. It was reproduced *imperfectly* in 1882, by the Imp. Archæological Commission. The ethnographical map of 1573 quoted above, is a part of that atlas). Three more REMEZOFF maps are here reproduced : Map of all the waterless and difficult country of the mountain steppe; The EKATERINHOF-palace Wall Map of N. Asia; Map of the Yakutsk Town-Territories.

Bef. 1733 The RENAT maps (two reproduced in fac-simile, with key maps).

1836 Sungaria, excerpt from KLAPROTH map.

1862 Sungaria, excerpt from the Kien-Lung Jesuit map.

1760 Sungaria, excerpt from the Kien-Lung Jesuit map.

1724 Sungaria, UNKOVSKY's map (with key map).

Among the appendixes to vol. I, I should mention a bibliography of the subject (MSS. and printed books, Russian and Non-Russian) and genealogical tables of Mongol and Kalmuk princes. Among the notes of vol. II, the two most interesting perhaps are one devoted to the traveller and adventurer NIKOLAI GAVRILOVICH SPATHARY (1625 or 1635-1708) — the records of his travels and residences in N. Asia fill more space (vol. II, p. 204-422) than all the other records here published; — and another devoted to the great personality of Father FERDINAND VERBIEST, S. J. By the way, Mr. BADDELEY seems to be unacquainted with the biographies of him given in 1912 and 1913 by H. BOSMANS, and in 1913 by A. DAMRY, also by L. VAN HEE (1). Other studies may have appeared apropos of the inauguration of VERBIEST's statue in his native place Pitthem, W. Flanders in 1913 (2). On the other hand, I draw the attention of VERBIEST's biographers to the new information on his life derived from Russian sources, which is contained in Mr. BADDELEY's book.

It is to be deprecated that only 250 copies of this important book have been published. Such a small edition would not even be sufficient to enable each large library of the world to obtain a copy. Much as I love beautiful books, I have no sympathy for that collector's aberration which prompts them to publish limited editions to increase artificially the number of rarities. It is as if they could only enjoy a thing to the extent that others were deprived of it. Their selfishness debases the love of letters and beauty into greed and speculation. Most of the books published in small editions by collectors are so unimportant that their scarcity does not matter, but when a work as fundamental as Mr. BADDELEY's is dealt with in the same way, there is good reason to be anxious and sad (3).

GEORGE SARTON.

---

(1) See *Isis*, I, 159, 551, 765; II, 268; IV, 146.

(2) See *Isis*, I, 705. The German invaders reaching that little village in 1914, must have been not a little surprised to be suddenly confronted with a Chinese mandarin!

(3) Mr. JOHN F. BADDELEY published previously: *The Russian Conquest of the Caucasus*, XXXVIII + 518 p., London, LONGMANS, GREEN & Co., 1908, and another book of his has just appeared: *Russia in the Eighties, Sport and politics*, XVI + 467 p. London, LONGMANS, 1921.

Vom Altertum zur Gegenwart. *Die Kulturzusammenhänge in den Hauptepochen und auf den Hauptgebieten.* Skizzen von F. Boll, A. Curtius, u. s. w. VIII + 308 p. Leipzig, Teubner, 1919.

The preface dated May 1919 and signed by Eduard Norden, professor of classical philology in Berlin, explains that the aim of this book is to provide the German people at a critical juncture with a careful estimate of their intellectual patrimony. The only way to endure the present misfortune is to look toward a new era and to be ready to work hard to reconstruct a new and better world. But in order to do that, it is more than ever necessary to take stock of all that the past has bequeathed to us. To do our share of the work with courage and faith it is enough to realize the continuity and the unity of civilization. Whatever happens, this unity, this integrity must be preserved. This is certainly a noble th ought and it is much to the credit of the German scholars that they prepared the writing of such a book at the darkest hour in the history of their country. This return to the past to strengthen one's ideal, is essentially a return to Greece, and this book is chiefly a study of Hellenism, of its relations with the modern world and its special signification under the new circumstances. It is placed under the patronage of Plato, Goethe and Humboldt.

The work is divided into two main parts, — one devoted to the unity of civilization in general at various periods of our history, — the other, considerably longer, to unity and continuity in special domains of human endeavour. This second part contains seventeen chapters, dealing with practically every aspect of modern culture. The first nine deal with law, politics, education, philology, history, literature, art, religion, philosophy. The others are devoted to special branches of science, and as these are of greater interest to the readers of *Isis*, I will quote the names of their authors : mathematics by Conrad Müller, cosmology and physics by Ernst Goldbeck, astronomy by Franz Boll, geography by Joseph Partsch, biology by H. Stadler, chemistry by E. v. Lippmann, medicine by Johannes Ilberg, technology by Albert Rehm.

It would be interesting to compare this undertaking with a similar one in England, due to the initiative of Francis Sydney Marvin (see *Isis*, II 425, III 419). Briefly, the German effort is much more comprehensive and systematic; it is more exclusively concerned with one part of the past, Hellenism; it is also more nationalistic. On the other hand, it must be noted that Marvin's endeavour is far more effective because it is repeated year after year, and takes the form of live lectures to a large and responsive audience before being crystallized in print and buried in book form. G. S.

Eugenio Rignano. — *Psychologie du Raisonnement*, XII + 544 p. in-8°. Paris, ALCAN, 1920. [15 fr.]

EUGENIO RIGNANO, le directeur de *Scientia*, à qui nous devons déjà plusieurs œuvres vraiment fortes et originales (1) vient de nous donner un nouveau livre tout à fait admirable. La thèse fondamentale de l'auteur c'est que « le raisonnement est constitué tout entier par le jeu réciproque des deux activités fondamentales de notre psyché : les activités intellectives et les activités affectives, les premières consistant dans la simple évocation mnémonique de perceptions ou d'images du passé, les secondes se manifestant comme des tendances de notre esprit vers une fin donnée à atteindre, vers laquelle est dirigé le raisonnement lui-même ». Il est à remarquer que les tendances affectives ont elles-mêmes une origine et une nature mnémoniques (le premier chapitre est consacré à la démonstration de cette thèse). Il suffit alors d'admettre cette spécificité unique — *la propriété mnémonique* — pour expliquer toutes les manifestations finalistes de la vie. C'est en effet grâce à cette propriété spécifique que les organismes vivants peuvent reproduire des modalités énergétiques d'adaptation *exclusivement par des causes internes*, ou en d'autres termes, c'est grâce à cette propriété que les êtres vivants sont mûs en partie par des forces *a fronte* et non pas seulement par des forces *a tergo*. On pourrait diviser l'univers en deux groupes nettement tranchés : le monde inorganique régi exclusivement par des lois physico-chimiques; le monde organique, régi par les mêmes lois, mais caractérisé en plus par la propriété mnémonique qui fait qu'aux forces externes s'ajoutent des forces internes. Le monde organique lui-même peut être divisé en deux nouveaux groupes, moins nettement tranchés toutefois : les êtres doués de la propriété mnémonique, et ceux chez qui à cette propriété s'ajoutent des activités affectives qui rendent possible l'élaboration du raisonnement, la manifestation la plus haute et la plus complexe de l'aspect finaliste de la vie. « De là vient, nous dit l'auteur (p. 535), la tragique et éternelle opposition entre notre vie intérieure, toute imprégnée de finalisme, qui sent que ce finalisme est la chair de sa chair et le sang de son sang, et le monde extérieur inanimé, qui, si anxieusement qu'on l'ait scruté durant des siècles et des siècles, ne nous semble mû, au contraire, par

(1) *Un socialisme en harmonie avec la doctrine économique libérale*, éd. ital., Turin, 1901; éd. franç., Paris, 1904. *La sociologie dans le cours de philosophie positive d'*AUGUSTE COMTE, éd. franç., Paris, 1902; éd. ital., Palerme, 1904. *Sur la transmissibilité des caractères acquis.* (Hypothèse d'une centro-épigénèse), éd. franç., Paris, 1906; éd. ital., Bologne, 1907; éd. allem., Leipzig, 1907; éd. anglaise, Londres, Chicago, 1911. *Essais de synthèse scientifique*, éd. franç., Paris, 1912; éd. angl., Londres, 1918.

aucune finalité. Et cette tragique et éternelle opposition entre le microcosme essentiellement finaliste et le macrocosme purement mécanique c'est elle qui constitue le substratum profond de la lutte plus que millénaire entre la science et la religion, la première contrainte par la raison fondée sur les faits à dénier à l'univers une finalité, la seconde, par contre, irrésistiblement poussée à l'affirmer par les plus intimes fibres du sentiment ».

La thèse de RIGNANO est appuyée sur une documentation à la fois très riche et très prudente et il la démontre avec beaucoup de rigueur et de méthode. Il suffira ici d'indiquer brièvement les grandes lignes de son exposé. Il s'efforce tout d'abord dans les trois premiers chapitres de retrouver par la méthode phylogénétique, l'origine et la nature intime des phénomènes psychiques fondamentaux : les tendances affectives et l'attention. Dans le chapitre IV, il examine la question *Qu'est-ce que le raisonnement?* et généralisant la notion du « Gedankenexperiment » de MACH, il montre que le raisonnement n'est autre chose en substance, qu'une combinaison mentale d'expériences imaginées. Il s'attache ensuite à montrer qu'une telle expérimentation mentale est bien loin d'être stérile. La fécondité du raisonnement est due d'une part à la fécondité même de l'imagination, d'autre part à l'intensité affective orientée vers le résultat à atteindre. « C'est cette affectivité, visant à une fin donnée ou recherchant le sort d'un objet donné, qui constitue, en somme, le phénomène psychique, qui, seul et unique, reste invariant durant tout le cours du raisonnement. C'est par suite elle qui *associe, lie, enchaîne* les unes aux autres, les diverses péripéties expérimentales, auxquelles on suppose soumis l'objet de notre désir; et c'est par suite elle qui constitue ce qu'on appelle le fil du raisonnement. » (p. 128). Les chapitres V et VI sont consacrés à l'étude de *l'évolution du raisonnement* : (1) du raisonnement concret au raisonnement abstrait; (2) de l'intuition à la déduction, et les chap. VII à IX, à l'étude *des formes supérieures du raisonnement* : (1) le raisonnement mathématique dans ses phases du symbolisme direct et indirect; (2) le raisonnement mathématique dans ses phases de condensation et d'inversion symbolique; (3) mathématiques et logique mathématique. Ces trois chapitres intéresseront tout spécialement les historiens des mathématiques; je n'essaie point de les analyser. RIGNANO montre ensuite qu'indépendamment de ce raisonnement constructeur, dont il vient d'étudier les manifestations les plus hautes, il en existe une forme dérivée et corrompue qui vise plutôt à classifier et à présenter des faits connus, d'une certaine façon plutôt que d'une autre. C'est ce qu'il appelle le raisonnement « intentionnel ». Il en distingue deux formes fondamentales, à l'examen desquelles les chapitres X et XI sont dévoués : le *raisonnement dialectique* et le *raisonnement métaphy-*

sique. Ces deux chapitres renferment d'excellents morceaux de critique, par ex. sa démonstration de l'inanité de la spéculation métaphysique, et sa critique des idées vitalistes. Dans le chapitre XII, RIGNANO étudie les *diverses mentalités logiques* : esprits synthétiques et analytiques; esprits intuitifs et logiques; esprits romantiques et classiques; esprits audacieux et esprits timides; imagination et érudition, originalité et mémoire; visuels et auditifs; raisonneurs constructifs et raisonneurs intentionnels; positivistes et métaphysiciens. La conclusion de cette revue c'est que les facultés logiques d'un individu sont influencées dans une très large mesure par sa nature affective. Pour compléter sa documentation, RIGNANO fait maintenant appel à la *pathologie du raisonnement* qui est admirablement traitée dans les trois chapitres suivants (XIII à XV) : (1) l'incohérence et l'illogicité des rêves. La théorie de l'auteur c'est que la propriété fondamentale des rêves c'est d'être *non-affectifs*. Cette théorie me paraît très satisfaisante; elle explique fort bien les phénomènes oniriques. Il est intéressant de remarquer que cette théorie est diamétralement opposée à celle de FREUD; (2) fous cohérents et illogiques par mono-affectivisme. L'étude des paranoïques et des monomanes est particulièrement intéressante parce qu'elle permet de distinguer et de séparer nettement deux caractéristiques fondamentales du raisonnement, la cohérence et la logicité; (3) fous incohérents par instabilité, impuissance ou absence des tendances affectives. La conclusion de ces études pathologiques, c'est que l'équilibre mental n'est qu'équilibre affectif et que la cohérence et la logicité de notre pensée sont essentiellement d'origine affective. Un dernier chapitre étudie le *raisonnement conscient et inconscient*. Après avoir établi que « chaque état psychique n'est pas lui-même ni conscient, ni inconscient, mais devient l'un ou l'autre seulement par rapport à quelque autre état psychique servant de point de repère » (p. 507), (cela est en partie une question de définition) (1) il s'efforce de prouver que la plupart des psychologues ont attaché une importance excessive à l'inconscient et qu'au contraire « le raisonnement, chez l'homme normal, se produit presque exclusivement à l'état conscient et que la part de l'inconscient dans l'idéation géniale est presque nulle ou tout à fait nulle » (p. 529). Quoique l'argumentation de RIGNANO soit assez convaincante, je ne puis accepter cette

(1) Ce chapitre nous donne aussi (p. 486) une excellente définition de la *compréhension* : « comprendre, c'est pour ainsi dire, rapporter au substratum affectif de l'individu tel ou tel groupe d'éléments sensoriels ou mnémonico-sensoriels; c'est donner une tonalité affective à ce que projettent en nous, du monde extérieur, nos sensations et nos souvenirs respectifs ».

dernière conclusion sans réserves. Il est certain que la part de l'inconscient a été exagérée, mais au risque d'être traité de « mystique » par l'auteur, il me semble que son propre radicalisme rend bien difficile l'explication du génie précoce, celui de MOZART ou de GALOIS par exemple.

Je me suis étendu assez longuement sur l'œuvre de RIGNANO, parce qu'elle est d'une importance capitale pour tous ceux qui s'intéressent à la philosophie et à l'histoire des sciences. Les historiens notamment y trouveront un bon nombre de matériaux sur la psychologie de l'invention. Il serait utile de comparer cet ouvrage au *Traité de Logique* de GOBLOT (cfr. *Isis*, III, 306). Ces deux livres sont indépendants et extrêmement différents, bien que les auteurs aient au moins un but commun, c'est-à-dire d'expliquer la fécondité du raisonnement. Mais GOBLOT est surtout un dialecticien et un philosophe, tandis que RIGNANO est plutôt un savant, un biologiste.

Il me paraît extrêmement désirable que la *Psychologie du Raisonnement* soit traduite aussi vite que possible en anglais.

G. SARTON.

Pierre Boutroux. — *L'Idéal scientifique des mathématiciens*, 274 p., Paris, ALCAN, 1920. [8 fr.]

M. BOUTROUX s'est proposé de dégager les tendances des mathématiques modernes de manière à pouvoir faciliter l'orientation des jeunes mathématiciens. Il s'est aperçu bien vite que cela lui serait d'autant plus facile que le passé des mathématiques lui apparaîtrait plus clairement. De là, sa curiosité historique, curiosité limitée d'ailleurs par son but pratique précis. « C'est dans l'histoire des sciences, convenablement étudiée, que nous avons le plus de chances de découvrir les fondements et la direction de la pensée scientifique. — L'histoire des sciences ainsi entendue est à égale distance de l'observation psychologique individuelle et de la systématisation philosophique. Elle est donc la préface naturelle de la philosophie des sciences » (1). — Il examine donc successivement avec beaucoup de clarté et d'élégance la conception hellénique des mathématiques, puis ce qu'il appelle la conception synthétiste. L'attitude du géomètre grec était surtout contemplative ; il s'efforçait de dévoiler la beauté, l'harmonie de l'uni-

(1) P. 8 — Que le lecteur me pardonne de rappeler que c'est là un point de vue que je défends depuis dix ans. J'ai fondé *Isis* (inspiré par COMTE) pour construire collectivement les fondements historiques de la philosophie des sciences. Voir par ex., t. I., p. 193-196.

vers et obtenait ainsi une science harmonieuse mais étroitement et arbitrairement limitée. — La conception qui s'élabore ensuite lentement grâce aux efforts des algébristes orientaux et chrétiens et qui triomphe vers la fin de XVII^e^ siècle est au contraire une conception synthétique d'après laquelle la mathématique idéale serait une construction logique effectuée suivant des règles fixes sur des éléments fixes. Un passage spécialement intéressant de cette seconde partie c'est celui (p. 116-129) où M. BOUTROUX s'attache à montrer que la partie la plus féconde de la nouvelle mathématique créée par NEWTON et LEIBNIZ n'était point le calcul des différentielles ni le problème de l'intégration, mais la théorie des développements en série. Les algébristes du XVII^e^ siècle se heurtaient au problème suivant : dans quelle mesure les fonctions transcendantes peuvent-elles être assimilées aux fonctions algébriques? Ce problème, — cette crise — est heureusement comparée par l'auteur, à celle que durent résoudre les géomètres grecs lorsqu'ils se heurtèrent aux quantités irrationnelles.

Un troisième chapitre est consacré à l'étude de « l'apogée et du déclin de la conception synthétiste ». Je ne puis m'arrêter à tous les bons endroits, car ils sont trop nombreux. L'auteur commence par expliquer le développement au XVIII^e^ siècle de la synthèse algebrico-logique, c'est-à-dire l'extension naturelle et l'organisation systématique des grandes conquêtes du siècle précédent. La richesse des résultats obtenus suggère aux mathématiciens que cette méthode algébrico-logique est toute puissante; elle les amène à concevoir une mathématique parfaite qui serait « une science synthétique et mécanique dont les calculs s'effectueraient, pour ainsi dire, automatiquement »; certains finissent par s'imaginer que les théories mathématiques sont une création libre de leur esprit et ne sont d'ailleurs que des instruments de démonstration : ils cessent de croire à l'objectivité des mathématiques. M. BOUTROUX expose habilement ces excès intellectuels en nous faisant voir tout d'abord les limites de la logique, ensuite les limites de l'algèbre. Il nous donne ainsi une critique excellente et d'ailleurs très mesurée, du mouvement logistique. A titre d'exemple il examine la notion de *fonction* et montre nettement (p. 167) que « cette notion est avant tout pour le mathématicien, un indéfini, un indéterminé. L'idée que nous en avons est plus riche et plus pleine que toutes les définitions ou expressions que nous pouvons donner ou construire. Par conséquent une théorie logique des fonctions, quelque parfaite soit-elle... ne pourra jamais satisfaire la curiosité et les aspirations du mathématicien. Pour acquérir sur les fonctions des connaissances neuves et fécondes, il est indispensable de retoucher sans cesse les définitions et les principes sur lesquels on opère. En d'autres termes, les progrès les plus importants que réalisent les mathématiques sont

obtenus, non en perfectionnant la forme, mais en modifiant le fond de la théorie. Ces progrès ne sauraient être regardés comme étant d'ordre logique ».

La fin de cette citation nous donne en quelque sorte l'idée mère du livre, car sa brillante esquisse de l'analyse moderne fournit à M. Boutroux mainte occasion de montrer que dans l'incessant conflit entre l'invention et le développement purement déductif, c'est de plus en plus l'invention, c'est-à-dire, le choix en apparence arbitraire de nouveaux problèmes ou de nouveaux points de vue qui joue le rôle prépondérant. Nous revenons ainsi à l'attitude grecque, car le choix implique une contemplation, et si notre intuition nous permet de découvrir de nouveaux faits mathématiques, il faut bien admettre que ces faits existent en dehors de notre esprit, qu'ils sont doués d'une objectivité intrinsèque. La notion mathématique de *fonction* n'est que le reflet de la notion physique de *loi*. « La correspondance mathématique n'est pas une conséquence des opérations algébriques; elle est l'objet même qui les détermine » (p. 206) (1). L'expression des faits mathématiques est nécessairement conventionnelle, mais les faits eux-mêmes ont une existence propre. Le géomètre ne les crée point; il les dévoile. — Il est possible toutefois que le contraste entre l'analyse du XIX^e^ siècle et celle des siècles précédents ne soit pas tout à fait aussi violent que l'auteur ne nous le fait croire. Sans doute la richesse des mathématiques modernes est si grande qu'elle nous donne parfois une apparence de désordre, et que le jeune mathématicien, doué d'imagination, est un peu comme un naturaliste dans un pays neuf. Mais cela n'est-il pas en partie une illusion due au fait que nous dominons les mathématiques du passé, tandis que nous sommes nous-mêmes dominés et pour ainsi dire écrasés par celles de l'avenir? Le conflit entre l'invention, l'exploration d'une part et d'autre part l'élaboration systématique, la construction logique n'est-il pas aussi vieux que la science? — Il faut concevoir le progrès des mathématiques (et de la science en général) comme une série de paliers de plus en plus élevés, interrompus par des rampes plus ou moins raides. Bien entendu si l'on regarde d'un peu plus près, on s'aperçoit que les rampes elles-mêmes ne sont qu'une succession de petits paliers, — les marches. Les inventions fondamentales semblent absolument différentes du labeur presque automatique qui se fait sur les grands paliers, mais la transi-

(1) Citons encore, p. 247 : « Il est impossible de considérer la mathématique comme le moule de la théorie physique, car il y a dans cette science même autre chose qu'un moule, il y a un fond objectif qui ne se laisse qu'incomplètement réduire en termes logiques ».

tion nous est donnée par les inventions secondaires, tertiaires, etc..., c'est-à-dire par des inventions de plus en plus concrètes et limitées.

Le livre de M. BOUTROUX est fort bien écrit et se lit avec beaucoup de plaisir. Peut être le chapitre IV, consacré à l'analyse moderne, aurait-il pu être un peu plus serré ; il ne me donne pas la même impression d'élégance que les autres. La seule objection de détail que je puisse faire m'est suggérée par la toute première page où l'auteur nous dit « que les mathématiques pures sont ni guidées par l'expérience, ni suscitées par les événements de la vie ». Voilà bien, un étrange *lapsus* et que du reste, la fin du livre dément. Ce n'est pas par hasard que certaines des plus grandes découvertes mathématiques ont été faites par des physiciens : ARCHIMÈDE, NEWTON, LAGRANGE, FOURIER... L'histoire nous enseigne que les différentes branches de la science ne progressent pas indépendamment. C'est d'ailleurs pour cela qu'il est utile d'étudier l'histoire de la Science, c'est-à-dire, l'histoire des interactions continues entre les diverses sciences. Il serait facile de montrer que presque toutes les inventions fondamentales de chaque science — toutes les grandes rampes dont je parlais tantôt — furent causées par de pareils phénomènes d'interaction. Il est indispensable de connaître l'histoire de la science pour comprendre le développement de chacune de ses branches.

G. SARTON.

Pierre Boutroux. *Les Principes de l'Analyse Mathématique* (exposé historique et critique), tome second, 460 p. chronological and historical notes (p. 461-482); Index (p. 483-507). Paris, Hermann et Fils, 1919.

The first volume of this work, which closes with « Book II, Chap. III, » has already been analysed in *Isis* (t. I, 1914. p. 734-742) by M. EMILE TURRIÈRE; and it has also been considered from a philosophical point of view in an editorial appearing in the same number above the signature of M. GEORGE SARTON. This first volume was divided into two Books; of which the first consisted of four chapters : « Les Nombres; » « Les Grandeurs; » « Les Figures; » « Le calcul algébrique; » and the second of three chapters : « Le calcul algébrique; » « Calcul des fonctions; » « Algèbre Géométrique; » under the main heading « Construction. »

The volume now under consideration starts with : « Livre Deuxième, chap. IV, Art. 579 »; so that it is a direct continuation of the first volume. It seems therefore a pity, as M. BOUTROUX considered it advisable to make the separation of his volumes take place in the middle of a Book, that a fresh pagination should be used for the

second volume. The separation here is justified, however, because in this chap. IV, the author leaves the algebraic view-point, and studies geometric figures « pour elles-mêmes ». He begins by pointing out that the application of arithmetic to geometry is as old as geometry itself, and that the fundamental metric theorems discussed in vol. I were the first-fruits of this application. Here we see the *motif* of the work; history, not for history's sake, but merely a tool to elucidate the progress of mathematical thought, to clarify the ideas underlying processes, and to promote development along similar lines.

Taking the contents of this volume in order, we have: (II, 4) « La géométrie algébrique ». In this the author, after a discussion of the reduction of geometric problems to a system of equations, proceeds to a consideration of the *Géométrie* of DESCARTES. Here M. BOUTROUX brings out well the point that made Cartesian geometry the important innovation that it was, namely, the fact that is was truly analytical. « L'équation d'une courbe renferme sous forme condensée, contient en puissance, *toutes les propriétés de la figure;* l'analyse les en fait sortir. » Further, it is pointed out that the order of the curve (*i. e.*, the number of possible intersections with a straight line) can by means of Cartesian geometry be made a matter of algebra; upon which point rests the possibility of an analytical infinitesimal calculus. The non-critical contents of this chapter serve as an excellent exposition of the facts and processes of elementary plane and solid coordinate geometry; with a section on the algebra of vectors of one dimension, and a brief mention of vectors of two and three dimensions, such as form the subject-matter of the *Ausdehnungslehre* of HERMANN GRASSMANN; and the chapter closes with a historico-critical discussion of descriptive (or synthetic) geometry, which leads to the consideration of linear and homographic transformations and the principle of duality, introduced by PONCELET and afterwards considered algebraically by PLÜCKER. In this chapter there is one point which I feel bound to criticize. M. BOUTROUX, in Art. 609, while calling attention to the fact that, if $F(x, y)$ is the *quotient* of $P(x, y)$ and $Q(x, y)$, then $F(x, y) = 0$ represents the same curve as $P(x, y) = 0$, whereas $(y - z)\,F(x, y) = 0$ represents the *two* curves $y - z = 0$ and $F(x, y) = 0$ *together*, yet states that equivalent algebraical equations represent the same curve. He misses the point for a quotient function, in which the *numerator and denominator have a common algebraical factor*. Thus, to take a very simple case, it should have been made clear that

$$(\text{I})\quad y(x-2) - x^3 - 6x^2 + 11x - 6 = 0,$$

$$(\text{II})\quad y = \frac{(x^3 - 6x^2 + 11x - 6)}{(x-2)},$$

and

$$(\text{III})\quad y = x^2 - 4x + 3,$$

represent three totally different things; and just where the equivalence is broken should have been pointed out. For (III) represents a parabola, (I) the combination of this parabola with a parallel to the y-axis, while (II) has an indefinite value for y for the value $x = 2$. These differences could have been brought out excellently by plotting curves for different values of a in the equation

$$y = \frac{(x^3 - 6x^2 + 21x - a)}{(x - 2)}$$

and observing the form of the curve as a approaches the value 6; or similarly from $y = \frac{(x^3 - 6x^2 + 11x - 6)}{(x - b)}$, when b approaches the value 2 from either side.

In (II, 5), M. BOUTROUX returns to the algebraic view-point. He starts by discussing critically the extension of algebra to what he calls *synthèse algébrico-logique*; and points out that for the purpose under consideration the extension of the algebraic method is not along the natural line, but to a study of things of a new sort, — convergent algebraic expressions defined as the result of an infinite number of operations. The discussion of these is deferred till later; and a section on determinants follows, in which the fundamental properties are proved and the application to the solution of sets of linear equations is demonstrated. Then we have a section on complex numbers, as a preliminary to the discussion of points at infinity and imaginary figures, under the heading *géométrie irréelle*; the usual tranformation to homogeneous coordinates being very lucidly illustrated by point-correspondance between a plane and a certain spherical surface. Then we are led back once again to pure algebra and the theory of substitutions and groups comes under consideration, reference being made to the work of SOPHUS LIE. There follow sections on the logical construction of mathematics, the definition of number, DEDEKIND'S theory; systems of geometry, Euclidean and non-Euclidean, coupled with the names of SACCHERI, LOBATSCHEFFSKY and BOLYAI on the one hand, and RIEMANN on the other; an explanation of algebraic logic, coupled with the name of BOOLE, closes the chapter.

In (II, 6), M. BOUTROUX leaves the domain of logic and returns to mathematical theory, and gives an account of the extension of the algebraic method to the consideration of series in which the number of operations is infinite. He first gives MERCATOR'S series for $\log_e(1+x)$, and then passes on to NEWTON'S generalization of the Binomial Theorem. The historical and critical accuracy of the work here, to my mind, suffers a temporary lapse; this is caused by (I) the deliberate rejection of the series of GREGORY and others as of no historical value,

and (II) the description of NEWTON's work of discovery in an inverted order. For the first point, the publication, by so many persons, by very different methods, of infinite series, almost simultaneously, leads us to but one conclusion; namely, that the *time was ripe for the discussion of processes involving an infinite number of operations*. In this connection also, mention should have been made of the infinite continued products of WALLIS, the infinite continued fractions of BROUNCKER, and the « Arithmetical Tetragonism » of LEIBNIZ, who especially speaks of his own series, $\pi/4 = 1 - 1/3 + 1/5 - \ldots$, (which by-the-way, was discovered and proved geometrically from a diagram of BARROW) as being a triumph, not because of the discovery itself, but because therewith a transcendent number was *for the first time expressed by means of natural numbers and the usual elementary operations of arithmetic*. As regards the second point, the inversion of the order of the description of NEWTON's work tends to throw a false-coloured light on the genius of NEWTON. M. BOUTROUX says « NEWTON fait une induction hardie »; he omits all mention of the real source from which the idea of the induction sprang — the *Arithmetica Infinitorum* of WALLIS, the inventor of the symbol ∞. It was while studying this book that NEWTON turned his attention to formulae for *interpolation*; he especially tried for a means of interpolation for $\sqrt{1+x}$ as a mean between 1 and $1+x$, by studying the coefficients of $(1+x)$, set down in the tabular form used and fully explained by WALLIS in the *Arithmetica*, which forced NEWTON to the recognition of the factor $(m-p+1)/p$. As I have shown in another place, the whole of the generalization, the whole of the work, stood forth self-evident — not needing either the brain-power or the imagination of a NEWTON — to anyone definitely seeking for an interpolation formula, as soon as the tabular form had been filled up, after the manner of WALLIS, for the first few positive integral indices. NEWTON obtained the series for $\sqrt{1+x}$ in WALLIS' factor style for the coefficients, and verified it by the square root process for the first few terms; then the series for $(1+x)^{-1}$ or $1/(1+x)$, verified by division; after that series for indices $3/2$, $-1/2$, in each case verified; then, and not till then, did he dare to generalize, as any mathematician of his time would have done. NEWTON owed the Binomial Theorem to WALLIS, just as EULER owed his Gamma Function to WALLIS and BROUNCKER. Another point; unless my memory fails me, NEWTON had accomplished the inversion of his $\sin^{-1}$ series, to yield a *sin* series, by a process of gradual approximation, before he had fully developed his *Analysis per Aequationes*. The $\sin^{-1}$ series was the first-fruit of the discovery of the Binomial expansion, combined with the differentiation and integration of an integral power of the variable, already known from WALLIS, and the fact that the differential coeffi-

cient of $sin^{-1} x$ was $1/\sqrt{1-x^2}$, probably learnt from BARROW and a geometrical figure. Thus,

if $$y = x + \frac{1}{2}\frac{x^3}{3} + \frac{3}{8}\frac{x^5}{5} + \frac{5}{16}\frac{x^7}{7} + \ldots$$

then $$x = y - \frac{1}{2}\frac{x^3}{3} - \frac{3}{8}\frac{x^5}{5} - \frac{5}{16}\frac{x^7}{7} + \ldots \qquad (A)$$

A first approximation is $x = y$; put this in the second term of (A), and obtain a second approximation by omitting higher powers than the cube — *i. e.*,

$$x = y - \frac{1}{6}y^3$$

use the second approximation in the second term of (A), and the first in the third term, or, what comes to the same thing substitute the second approximation in the terms of (A) and omit powers that are higher than the fifth, and so obtain a third approximation in the form

$$x = y - \frac{1}{6}y^3 + \frac{1}{120}y^5$$

and so on. Now it is seen that by this method, the inverse series could only be obtained when y tends to x as x becomes small; thus we have the *motive* for the search for a *general* method, such as called forth the *Analysis per Aequationes*.

It is to be noted that M. BOUTROUX brings out the point that NEWTON and his contemporaries never bothered themselves with convergency while the series was being sought. After the series had been obtained, by no matter what means, all that remained was to determine whether the series was arithmetically intelligible. Thus we can imagine a NEWTON of today using divergent series in his research, obtaining a convergent series as a result in some special case, and being quite satisfied with it. This was the spirit of the induction used by WALLIS, which might have been put in words; « Nature never intended such a thing to be true in such a large number of cases, unless she intended it always to be true ». This was the spirit that led NEWTON, after verifying the truth of his interpolations for a number of cases, naturally and without any qualms to boldy generalize the Binomial expansion.

The second section of this chapter is naturally the consideration of tests of convergence of infinite series; and this just as naturally leads to a discussion of the circle of convergence, and TAYLOR's series; with this we come to the end of Book II.

Book III treats of « ANALYSIS »; and consists of four chapters dealing respectively with : — « *Analytic method in Mathematics* » « *Infinites-*

imal Analysis»; « *Analysis of the Principles of Mathematics* »; «*Analysis of the Notion of a Function* ». The first chapter consists of a single critical section which discusses the two great tendencies of altogether different character that actuate the mathematician; the contemplative tendency that seeks for development by the demonstration of new results, and the constructive tendency for which method is of paramount importance. From this there is a natural transition to the second chapter dealing with Infinitesimal Analysis; for the history of this is perhaps one of the most striking examples of the alternations of these two great tendencies. First the machinery and the notation is perfected; then comes the consideration of the axioms and the efforts to reduce these to a minimum; then the analysis of these axioms, such as the notion of continuity, to find out what is essential and what hypotheses are necessary and sufficient for the purpose in hand; finally, the very heart of the matter, the notion of function, is attacked. Thus, in the words of M. BOUTROUX, « L'analyse aboutit toujours à des constructions nouvelles. Elle ne rend pas la synthèse inutile, mais lui sert de préface et la conditionne. »

M. BOUTROUX opens his discussion, in chap. II, with CAVALIERI'S *Geometria Indivisibilibus*, and gives a clear account of the objections made to it by GULDIN, and the justification of his ideas by CAVALIERI in his *Exercitationes Sex*, a work published 12 years after the other. M. BOUTROUX, after giving the summation of the area under the parabolas ($y = x^n$), without mentioning the work of WALLIS, proceeds *per saltum* to the idea of a limit, coupled with the name of CAUCHY, a jump of at least 150 years. Surely it would be more in keeping with the spirit of this work to have followed the historical line and to have brought out the fact that CAUCHY « *fut le premier à tirer au clair l'idée générale de limite* », long after the calculus was fully developed as a tool in the hands of LEIBNIZ, the BERNOULLIS and EULER. Leaving that as a debatable point, and acknowledging that after all M. BOUTROUX is the best judge of the order in which matter should appear in his own book, yet, having given such a lucid account of the notion of a limit, surely he might have spared us the confusing, if time honoured, symbolism, $0/0$, $0 \times \infty$, and the like, for indeterminate forms. I am far from being satisfied with Art 903, in which M. BOUTROUX deduces the conclusion that the sum of the rectangles under a curve has a limit *in general*, and that that limit is the area under the curve — a *general geometrical limit*, be it noted — from the arithmetical results obtained with regard to *special* curves. Especially so, since it would have been so easy to have demonstrated the matter *geometrically*, by transferring the limit of error, the difference between the inscribed and the circumscribed rectangle, for each pair of consecutive ordinates, to the space between

the ultimate pair of ordinates; and thus visualized the total limit of error as a rectangle of finite height standing on a base which diminishes indefinitely as the number of ordinates increases, and can be made smaller than any assignable length by taking the number of ordinates great enough. This would not only have brought the demonstration dead into line with the notion of limit already explained; but it would have also been historically accurate, for it is thus that both BARROW and NEWTON deal with it. But BARROW is not mentioned at all in the text of this volume; indeed, from the historical note on BARROW in the appendix, it would seem that M BOUTROUX is not very familiar with BARROW's work It is not the case that BARROW chiefly « s'occupa du problème inverse des tangentes»; the *Lectiones Geometricae* form, when translated into coordinate geometry, a complete text-book on the differentiation and integration of the functions then known, their products, etc., and a proof that differentiation and integration are inverses; all under the guise of the drawing of tangents and the finding of areas. Neither is it true that the collaboration of NEWTON extended beyond the second edition of the *Lectiones Opticae*, with which the first edition of the *Lectiones Geometricae* was bound up and issued as one volume. M. BOUTROUX, however, realizes that his assumption is unjustifiable as an assumption, and must be demonstrated in the general case. So, in Art. 908, he has recourse to an Archimedean type of proof which, in effect, defines the area under the curve by a method analogous to the Dedekindian definition of an irrational. He has two infinite series, one having no highest term, and the other no lowest term; and he shows that the area is greater than any term of the first series and less than any term of the second series, and therefore is a limit for either under the conditions of the problem.

Again, in my opinion, M. BOUTROUX altogether misses the meaning of the passage which he quotes from GERHARDT's edition of the early mathematical writings of LEIBNIZ. He attributes to LEIBNIZ the argument that d diminishes the dimensions because dx is infinitely small compared with x. Shades of LEIBNIZ! In the particular passage from which the quotation is made, dx, if it had occurred, would have denoted a rectangle! M. BOUTROUX's words are : « La somme $\int$, somme d'un nombre infini de termes, est infiniment grande par rapport à ses termes (elle est d'un *ordre de grandeur* supérieur, donc elle est finie si ses termes sont infiniment petits); la différence est infiniment petite par rapport à la quantité dont elle est l'accroissement (elle est d'un *ordre de grandeur* inférieur); ainsi écrit LEIBNIZ *ut* $\int$ *augebit, ita* d *diminuet dimensiones* ». Either I must be mistaking the meaning of the above quotation, or else M. BOUTROUX has made a very bad error, and has got a totally wrong conception of the whole passage from

which the quotation is taken. The word *dimensiones*, as always with LEIBNIZ, has its everyday meaning in mathematics. LEIBNIZ states that $\int$ converts a point into a line, a line into an area, an area into a volume, *i. e.*, increases its dimensions; similarly, d, which LEIBNIZ writes in the *denominator*, diminishes the dimensions, converting an area into a length in the particular case he is considering. Let me state the whole passage and try to explain it correctly.

« Given l and its relation to x, to find $\int l$. This is to be obtained from the contrary calculus, that is to say, suppose $\int l = ya$ Let $l = ya/d$; then just as $\int$ will increase, so d will diminish the dimensions. But $\int$ means a sum, and d a difference. From the given y, we can always find y/d, or l, that is the difference of the y's. Hence one equation can be transformed into the other; ... ». This is my interpretation of the passage. LEIBNIZ knows that $\int l$, the sum of all the ordinates of a curve, is an area. Hence taking y to be a length, the ordinate of another curve which he usually calls a quadratrix, he introduces the length a to keep the dimensions correct, *i. e.*, ya is a rectangle equal in area to the sum of all the ordinates, $\int l$, which gives the area under the first curve. Then he argues that l must be an area divided by a length, and he introduces the *length* denoted by d to *keep the dimensions correct*. Thus here we see that $\int$ increases the dimensions, converting a line into an area, and d, in the denominator, decreases the dimensions by converting an area into a length. There are many examples of this introduction of a constant to keep the dimensions correct scattered throughout these early manuscripts; and in this case it is clear that d is the *subtangent*. I will try to imitate as far as I can the manner, diagram, and lettering of LEIBNIZ; he does not give a figure, and for a very good reason; he was considering one of BARROW's figures, when he wrote the above.

Let AC be a curve, whose axis is AB, and let the ordinate BC be l; let AD be another curve having the same axis, and let its ordinate be called y; let this curve AD be such that, for all positions of C, the area ABC, *i. e.*, all-the-l's or $\int l$, is equal to the product of BD and a given line, *i. e.*, equal to ya: then taking B (B) equal to unity (the usual thing with LEIBNIZ, and akin to NEWTON's unit-0) we have

$$l = \text{BC}.\ \text{B (B)} = \text{area ABC} - \text{area A (B) (C)}$$
$$= a.\ \text{BD} - a.\ \text{(B)(D)} = aw;$$

where $w = \text{BD} - \text{(B)(D)} = \text{DN}$ the difference between the y's.

But, DN : B (B) = DN : (D) N = BD : BT = $y : d$ say, where d is the subtangent. But since B (B) is unity, we have

$$w = \text{DN} = \frac{y}{d}, \text{ and therefore } l = \frac{ay}{d}.$$

« But », continues LEIBNIZ, « d signifies a difference... ». I think this is now plain; it is a contemplative note. LEIBNIZ, who is accustomed to writing down all his thoughts, *wonders* at the remarkable conclusion to which he has come : $\frac{y}{d} = w$, the difference between the y's, which hitherto in his work on series he has always called dy ; « how then can $\frac{y}{d}$ and dy stand for the difference of the y's? » This worries him, and later we find him trying to find a meaning for d as an operator, in a MS. dated November 11, 1675, where he considers whether $dx\ dy$ is the same as $d(xy)$, or $d\left(\frac{x}{y}\right)$ the same as $\frac{dx}{dy}$, *i. e.*, in other words, is d distributive in a product and quotient as it is in a sum or difference? Further, with the explanation I have given of the passage (and I cannot see any other explanation that will make it continuous sense), LEIBNIZ gives an exact line for line analytical equivalent of Lect. X, Prop. 11 of BARROW's *Lectiones Geometricae*, wherein is proved geometrically and rigorously that differentiation is the inverse of integration. Thus, read as I consider rightly, in this passage, LEIBNIZ gives *for the first time* a rigorous proof of an analytical nature for this proposition. For all we have to do is to put B (B) = dx instead of unity; then, if we call the subtangent t instead of d to avoid confusion, we have $t = \frac{y}{(dy/dx)}$ instead of $\frac{y}{w}$; also $\int l$ becomes $\int l\ dx$, as afterwards used by LEIBNIZ. Then we have the theorem :

$$\text{If } \int l\ dx = ay; \text{ then } l = \frac{ay}{t} = a\frac{dy}{dx}$$

I have felt all the more bound to dwell at length on the point made above, because, in Art. 911, M. BOUTROUX argues, with some justice perhaps from one point of view, that the notion of function was more important than the technique of a calculus; while he asserts that the general theory of functions owes more to NEWTON than to LEIBNIZ. What then is left to LEIBNIZ? His notation only?

M. BOUTROUX, to my thinking, seems to have got a wrong impression of this early work of LEIBNIZ. For instance, in a footnote to Art. 914, he gives 1684 as the date of publication, in *Acta Eruditorum*, of LEIBNIZ' algorithm; but he does not state that in GERHARDT's work on the early MS. of LEIBNIZ, which he has already quoted, there is given a full statement of the algorithm — *i. e.*, for powers and roots as

well as for addition, subtraction, multiplication and division; the date of the MS. being July 11, 1677. Nor does he mention that of this there is a detailed revision, probably the rough draft from which the essay in *Acta Eruditorum* was worked up; in this LEIBNIZ, while he uses infinitesimals, has arguments and proofs that are geometrical, and it is the ratio of infinitesimals that is considered primarily. Again, in Art. 920, M. BOUTROUX is apparently following LEIBNIZ' development in the matter of differentials of the second order; and he mentions the strictures of NIEUWENTIJT. But he does not comment on the reply of LEIBNIZ (contained in the GERHARDT publication), in which proofs of the infinitesimal equalities are given by the use of (dx), (dy), (dz), (dv), *finite quantities which are taken proportional to* dx, dy, dz, dv. In this reply there is no use of anything of the nature of $\frac{d^2y}{dt^2}$; whereas we do have the use of $\frac{ddy}{ddx}$. Early in his work, November 1675, LEIBNIZ seems to be considering d as an operator, — for his d, owing to the fact that dx is considered as unity, is really $\frac{d}{dx}$: and later this idea seems to have been more insistent. This gives a more feasible origin for the symbolism $\frac{d^2y}{dx^2}$ than that given by M. BOUTROUX : thus : — ddy, or d^2y, with LEIBNIZ, since dz is the difference in the z's corresponding to a small unit difference, dx, in the independent variable x, really means $\frac{d}{dx}\left(\frac{d}{dx}\right)y$, *i. e.*, $\left(\frac{d}{dx}\right)^2 y$; and this is $\frac{d^2}{dx^2}\,y$ or $\frac{d^2y}{dx^2}$. In this reply too, LEIBNIZ states his Law of Continuity, and gives several examples of cases in which a limit of a sequence may sometimes be considered as a term of the sequence, at least in his opinion.

My reason for this lengthy criticism of this one section of M. BOUTROUX's work is that, altough his separate sections are labelled analysis of this that and the other, his work is *tacitly*, and must be considered to be in its most important bearing, an *analysis of the progress of mathematical thought*. The work of LEIBNIZ is a condensed epitome of such progress, and no finer example could have been given. I should have liked to have seen at least twenty or thirty pages devoted to LEIBNIZ, and the comparison with his predecessors, contemporaries, and immediate successors; from this could have been deduced the manner in which discoveries are made, that they are made simultaneously by different men *when the time is ripe*, and that they are gradually led up to, even in the case of the work of one of the discoverers, by *a necessity*

for the first step, and after that, by suggestions and further necessities arising out of the work to which the first step is due.

The whole of M. BOUTROUX's rather laboured work on infinitesimals seems to me to have the aim of legitimatizing the separation of the variables in a differential equation, so that $P(x) = Q(y)\frac{dy}{dx}$ may be written as $P(x)\,dx = Q(y)\,dy$, and then integrated. But surely a better way of legitimatizing the work is to say that it is only a convenient device, and that what is really meant is represented as follows :

If $P(x) = Q(y)\frac{dy}{dx}$; then, on integrating with regard to x, we have

$$\int_{x_0}^{x} P(x)dx = \int_{x_0}^{x} Q(y)\frac{dy}{dx}\,dx\,;$$

in which the factor $\frac{dy}{dx}$ (or as LEIBNIZ would have written it, $\frac{(dy)}{(dx)}$) is the finite ratio of the ordinate to the subtangent; and thus $(dy) : (dx) = dy : dx$, that is to say, $\frac{(dy)}{(dx)}\,dx = dy$, where the dy and dx are the infinitesimals used in integration. Hence

$$\int_{x_0}^{x} P(x)dx = \int_{x=x_0}^{x=x} Q(y)dy = \int_{y=y_0}^{y=y} Q(y)dy$$

where (x_0, y_0), (x, y) are corresponding values of the variables. Anyway, this is more in accordance with historial development : LEIBNIZ is continually hovering apparently between differentials and differential coefficients, and perhaps never attains really to NEWTON's supreme idea, the notion of rate; but his ideas are at least direct and rigorous, though sometimes he cannot explain them clearly in his earlier work, on account of the fact, as noted before, that he takes dx as unity, which conceals the fact that, when he apparently uses infinitesimals, he is in reality using a differential coefficient.

I have spent so much time over this that I can only give brief notice to the remainder of the work; which is perhaps the most important part of it. Sections 5 and 6 deal with definite integrals and line integrals; with a discussion on the coefficients of FOURIER's series, in the first section, and a demonstration of the necessary and sufficient condition that a line integral should be independent of the form of the arc joining two given points, in the second section. Sections 7 and 8 discuss double and triple integration, and their application to areas and volumes. Sections 9 and 10 demonstrate the application of infinitesimals to geometry and mechanics; in the latter, force is *defined* dynamically, *i.e.*, as something proportional to the acceleration, which is the first time-derivative of the velocity, this in turn being the first

time-derivative of some position abscissa; *i.e.*, NEWTON'S LAWS are taken as definitions of force. This last section closes chapter II.

Chapter III starts with a discussion on Continuity (§ 1), proceeds to aggregates (CANTOR, § 2), and discontinuity (RIEMANN, BAIRE, LEBESGUE, § 3). Section 4 deals with the fundamentals of geometry, the geometry of HILBERT, and the axiom of ARCHIMEDES; and closes a most important and well-handled chapter, which, however, might with advantage have been extended a little, as regards § 1, to include a note on LEIBNIZ' idea of continuity of *state* as contrasted with continuity of *matter* (with atomic theory) and *geometrical* continuity, giving as illustrations a discussion of the paradoxes of ZENO and the theory of BOSHCOVIC.

Chapter IV opens with the contention that the fundamental general notion of a function depends on correspondence or relation. Then follows a long section, admirably treated, on the first principles of the theory of functions; this leads to sections on analytical functions and CAUCHY'S theorem, singularities, classification of functions, and periodic functions; and the volume closes with the Existence Theorem of CAUCHY.

There is an appendix giving short accounts of famous mathematicians in chronological order, which is distinctly useful. But surely it was unintentional to have omitted the name of TORRICELLI, who was important as a worker on the problem of tangents. Indeed, if we are to believe an almost contemporaneous account of the work of TORRICELLI, given by TOMMASO BONAVENTURA in 1715, as a preface to TORRICELLI'S *Lezione Accademiche*, the latter was the originator of the idea of indivisibles as ascribed to CAVALIERI. For we read : « in the Dialogues, which Father CAVALIERI had already prepared in reply to Father GULDINUS » (this would seem to refer to the *Exercitationes Sex*), « who in a book published by him just at this time, had violently attacked *the doctrine of Torricelli* » (the italics here are mine). BONAVENTURA goes to the length of accusing the French savants and BARROW of borrowing from TORRICELLI'S communications to them and publishing his theorems without acknowledgment. It would seem therefore that TORRICELLI should have had his name included in the list.

(Manchester, England.) J. M. CHILD.

L. E. Dickson. — *History of the Theory of Numbers :* VOL. II « Diophantine Analysis ». XXV + 803 p. Carnegie Institution of Washington, 1920.

This is the second volume of a work, of which the first volume has already been reviewed in *Isis* (iii, 446). What was said about the latter applies to the former, if indeed the second volume does not deserve higher praise than the first. As the title shows, it is solely confined

to the enormous and intensely interesting literature of Diophantine Analysis.

As in the case of the first volume, we have here a preface, of some ten to twelve thousand words, which might well stand, for most readers, as a concise history of the subject. The author therein states his point of view with regard to the aim of a historian; namely, to give a record of facts, with no attempt to follow out the sequence of deduction of these facts from earlier facts. He considers that « at least the germs of many important results are discovered by a sudden and mysterious intuition, perhaps the result of subconscious mental effort ». To the reviewer it appears that the whole of the truth in the passage cited above lies in the last six words, and that the rest is a direct contradiction to those six. Thus, in a history, it is the *sequence* of development of thought that is of paramount importance and the most valuable aid to further research. A new method in general arises from a more or less accidental *connection* of one man's method with another man's subject by a third man; the genius of the third man consists in the *capacity for observing that the connection is possible*; the rest is mere skill and eruditon. As an illustration, take EULER's application of WALLIS' methods and BROUNCKER's Continued Fraction to the solution of the so-called PELL Equation, and the invention of the Beta and Gamma Functions. This capacity for observation of the possibility of a connection may be, most probably is, due to a lively and orderly subconsciousness. Surely, then, the more our third man knows of the *development of mathematical thought*, the greater chance there is that he may recognize the possibility of the connection.

However, the author has given us his work according to his own stand-point; and we are bound to accept this stand-point, if we propose to make use of his book or to criticize it; in this case, we can do nothing but give that praise which is so well-deserved by Prof. DICKSON and the mathematicians who have assisted him. At the very least, if in times to come some other author shall take in hand the writing of a history of the development of ideas in number theory, Prof. DICKSON will have saved him the work of years in the collection of material, and put him under an obligation which it would be almost an impertinence to consider was met by mere acknowledgment and thanks.

The table of contents is too long to be reproduced here; but modern interest is especially awakened over Chapter XXV (which gives an account of WARING's Problem), owing to the recent work of G. H. HARDY and J. E. LITTLEWOOD. Chapter XXVI, forty-five pages on FERMAT's Last Theorem, will also appeal to many readers; especially owing to the report that, before these lines appear in print, a complete proof of the theorem will have been published. J. M. CHILD.

Heinrich Wieleitner. *Geschichte der Mathematik*, II. Teil, II. Hälfte. Sammlung Schubert, LXIV. VI+220 p. Berlin und Leipzig, 1921. [In Germany, 45 Marks; in America, $ 2.25].

This work is a continuation of the one begun some years ago by Prof GÜNTHER and BRAUNMÜHL, of which the first volume was completed by the former in 1908, after the death of the latter. It represents not merely the scholarschip of Prof. WIELEITNER, but the care of ENESTRÖM and TROPFKE in reading the proof sheets. It may, therefore, be safely considered as a reliable work of reference. The author has divided his presentation of the subject into nine chapters relating respectively to (1) the analytic geometry of the plane, with special reference to conic sections; (2) solid analytic geometry and surfaces; (3) higher curves in general; (4) special curves; (5) differential geometry; (6) perspective, together with descriptive geometry; (7) projective geometry; (8) trigonometry; (9) elementary geometry. This is a large field to attempt to cover in such a small treatise, but the author, has been successful in condensing his presentation of the several topics and in giving a satisfactory survey that will be found helpful to students and teachers. Whether the great discrepancy between the German price and that which foreign scholars are asked to pay for the book will prove to be profitable to the publishers or the German government is very doubtful.

DAVID EUGENE SMITH.

Oscar [Christian Strange] Preisler [b. in Aarhus, Denmark, 1879, Jan. 6 — d. Kongens Lyngby, nr. Copenhagen, 1920, May 16]. *Bibliographisher Führer durch die medizinische Literatur.* Ein Grundriss. 87 p. gr. in-8°. Köbenhavn, Det akademiske antikvariats haandböger, 1920.

J. W. S. JOHNSSON explains in a short Danish preface that the author had prepared this bibliographical introduction for publication in Germany, but that the war shattered his plans. After the death of the author, his widow intrusted the manuscript to J. W. S. JOHNSSON, who under the new circumstances, decided to have it published in Denmark. The text is the original text, dated Sept. 1916, without any change or addition.

This bibliography seems to be very carefully compiled and it will prove useful, — much less however than if critical notes had been added to enable the reader to make a reasonable choice between so many items. The book is subdivided as follows : I. *Algemeiner Teil* : Terminologia medica, Lexica; allgem. bio-bibliographische Werke;

Biographie. — II. *Spezieller Teil* : (1) Anatomie; (2) Mikroskopische Anatomie; (3) Anthropologie; (4) Entwicklungsgeschichte; (5) Biologie; (6) Biochemie; (7) Physiologie; (8) Allg. Pathologie und pathol. Anatomie; (9) Bakteriologie, Mikrobiologie und Parasitologie; (10) Immunitätsforschung. — III. *Spezielle Pathologie und Therapie* : (11) Innere Medezin; (12) Infektionskrankheiten; etc...; (33) Hygiene; (34) Soziale Medizin; (35) Gerichtliche Medezin.

Each section is divided into four subsections : (1) history; (2) bibliographies and annual reviews; (3) indexes to periodicals; (4) textbooks and monographies.

A final section (no. 36) is devoted to the *history of medicine* (p. 75-85); it contains *inter alia* paragraphs devoted to the history of science in general, medicine and art, history of medical knowledge, history of the medical profession and teaching, history of the medical academies, anecdotes and curiosities; history of hospitals, popular medicine.

G. SARTON.

Dannemann, Friedrich. — *Die Naturwissenschaften in ihrer Entwicklung und in ihrem Zusammenhange.* 2te Aufl. — I. Bd. Von den Anfängen bis zum Wiederaufleben der Wissenschaften. XII + 484 S., 64 Abb. Leipzig, ENGELMANN, 1920.

I have published a long review of the first edition of this work when its fourth and last volume appeared (1913) in *Isis*, II, 218-222. The first volume came out in 1910. Unfortunately I cannot compare the new edition with the old, for the latter disappeared from my Belgian library during the war. However comparing the new volume with my review of the old (*Revue générale des Sciences*, t. XXII, p. 931, 1911), I notice that the text has been materially increased (496 p. instead of 380) and that there have been some slight changes in the titles of the chapters. These titles are as follows in the new edition : (1) Origins of the sciences in Asia and Egypt; (2) Development of science in Greece until the time of ARISTOTLE; (3) The age of ARISTOTLE; (4) The Alexandrine period; (5) Roman science; (6) End of ancient science; (7) Decadence of sciences in the early Middle Ages; (8) The Arabic period; (9) Sciences under the influence of Christian-*Germanic* culture; (10) Renaissance of science; (11) COPERNIC; (12) The reconstruction of the inorganic sciences. In short these 500 p take one from prehistoric times until the days of GALILEO. That may seem a very swift progress, yet DANNEMAN's is the most elaborate history thus far in existence! Is any other proof needed to show that our studies are still in their infancy?

The value of this new edition is increased by the collaboration of

E. WIEDEMANN, E. v. LIPPMANN and J. WÜRSCHMIDT. Many *errata* and *addenda* mostly contributed by them are given on p. 478-484. Because of WIEDEMANN's collaboration, I turned with special eagerness to the chapter devoted to what is improperly called Arabic (instead of Mohammedan) science (1), but this chapter does not seem to me very different from the old one? May be I am wrong, for I have to depend on my memory. At any rate we would expect more from the learned Arabic scholar of Erlangen. — In my first review, I complained that the account of EUCLID's work was insufficient : has any material change been made? at any rate the account is still very meager.

Of course the reader must not forget the limitations to which the author had to submit himself : to tell the whole history of all sciences from the beginning of civilization to the XVIIth century in 500 pages is a sort of a wager. The result however good cannot interest the scholar. Taking these limitations into account, DANNEMANN's book is satisfactory; in fact it is by far the best of its kind and as such it would be useful to translate it into English.

G. SARTON.

Zeitlinger, Heinrich. *Bibliotheca Chemico-Mathematica.* Catalogue of works in many tongues on exact and applied science. With 127 plates containing 247 portraits and fac-similes, 2 vol., XII+964 p. London, HENRY SOTHERAN, 1921 [3 guineas]

A very interesting catalogue of books for sale by the well-known London firm, SOTHERAN & Co. It contains 17.397 items, many of which are followed by short biographical and bibliographical notes and is richly illustrated by 247 portraits and fac-similes. This is certainly the largest bibliography of its kind which has thus far appeared.

This is about the most that can be said in praise of this trade catalogue. Unfortunately, there is very much to say against it, and it must be said, the more so that the price of this book is extravagantly high.

For one thing, this is not by any means a complete list for it contains only the items which happen to be for sale at SOTHERAN's. Neither is it critical, for anything which is for sale is considered quotable, and but for the accidental annotations (many of which deal with trivial or unessential matters), all items are put on the same level. Of course

(1) The more so that some of the greatest scientists of Islam were distinctly *not* Arabs.

a bookseller is more interested in mere bibliographic rarity and monetary value than in intrinsic value. Yet as a price list this catalogue is and will remain a very interesting document. In the second place, alhough there is a useful subject index, there is no author index. Now the general arrangement of the kook is as follows. There is a first list of 284 p. (5602 items), the authors being quoted in alphabetical order. Then follows a supplement (p. 285-786) and further *addenda* (p. 786-788) in the same order. Finally a new list classified by subjects : general works, mathematics, astronomy and geodesy, physics etc., the authors being quoted in alphabetic order under each heading. Hence to find *ex. gr.* CANTOR's books we have to look into four or five different parts of the book. And what shall we find : (1) on p. 34, mention of CANTOR's *Vorlesungen*, first vol. of the first ed. only, without any explanation ; (2) on p. 343 a mention of the same work, first ed. of vol. I and II, 2nd ed. of vol. III with the note : « The standard work on the history of mathematics, indispensable to any good scientific library » ; (3) in the further *addenda*, no CANTOR ; (4) on p. 798, a mention of the same work, the latest ed. of the 4 volumes at last, with a note repeating the preceding one and adding the name of the contributors to vol. IV. That is, after having lookèd in four different places, I have found three items referring to the same work (of which two were incomplete) and I have found no mention of any other work or paper of CANTOR !

Of course any such large accumulation of titles can but prove useful once in a while, but I have said enough to show that it must be used with great circumspection. The collection of plates illustrating the book is most interesting and forms in my opinion, its most valuable feature.

GEORGE SARTON.

Aldo Mieli (*editor*). — ***Gli scienziati italiani dall' inizio del medio evo ai nostri giorni.*** Repertorio biobibliografico dei filosofici, matematici, astronomi, fisici, chimici, naturalisti, biologi, medici, geografi italiani. Volume I. Parte I. VIII + 236 p., 47 fig., 28 × 20 cm. Roma, NARDECCHIA, 1921.

I have already explained the aim and method of this very remarkable collection in *Isis*, III, 59. Suffice it to add that the promises made by the editor have been kept and that the first installment of his great undertaking is an auspicious beginning. Of course when judging this collection we must take into account the fact that it is the result of a very free collaboration ; we can not expect every article to be on the same level. There are many portraits and autographs and the biblio-

graphical and iconographical notes seem to have been prepared with great care. I quote below in chronological order the scientists included in this first volume, adding the name of the author of each notice.

XIII (1)

Fibonacci, Leonardo, mathematician (Gino Loria).

XVI (9)

Alpino, Prospero (1553-1616), botanist (A. Béguinot).

Anguillara, Luigi (or Luigi Squalermo), (c. 1512-1570) botanist (G. B. De Toni).

Biringuccio, Vannoccio (1480-1539?), chemist, mining engineer (Mieli).

Ghini, Luca, (c. 1490-1550) botanist (G. B. De Toni).

Guilandino Melchiorre, (c. 1520-1589) botanist (G. B. De Toni).

Magini, Giov. Ant., (1555-1617) astronomer (A. Favaro).

Maranta, Bartol., (c. 1500-1571) physician, botanist (G. B. De Toni).

Moletti, Giuseppe (1531-1588), astronomer (A. Favaro).

Silvestri, Francesco (1474-1528), philosopher (Giac Sestili).

XVII (5)

Baranzano, Redento (1590-1622), philos., astronomer (G. Boffito).

Bertini, Anton Franc. (1658-1726) physician (A. Corsini).

Cestoni, Diacinto (1637-1718), naturalist (G. Stefanini).

Folli, Francisco (1623-1685), physician, naturalist (G. Goretti-Miniati).

Riva, Giov. Gugl. (1627-1677) anatomist, surgeon (C. Artom).

XVIII (7)

Bertini, G. M. S (1695-1756), physician (A. Corsini).

Chiarugi, Vincenzo (1759-1820), physician, psychiatrist (A. Vedrani).

Cocchi, Ant. (1695-1758) physician (A. Corsini).

Corti, Bonaventura (1729-1813), botanist (G. B. De Toni).

Cotugno, Domen. (1736-1822), physician (G. Bilancioni).

Pontedera, Giulio (1688-1757), botanist (A. Béguinot).

Valli, Eusebio (1755-1816), physician (A. Vedrani).

XIX (13)

Acri, Francesco (1779-1851), philosopher (E. P. Lamanna).

Amici, Giov. Bat. (1786-1863) physicist, naturalist (G. B. De Toni).

Bertini, Gius. (1772-1845) physician, hist. of medicine (A. Corsini).

De Visiani, Roberto (1800-1878), botanist (A. Béguinot).

Dini, Ulisse (1845-1918), mathematician (G. Loria).

Figari-bey, Ant. (1804-1870), traveller, naturalist (G. Stefanini).

INGHIRAMI, GIOV. (1779-1851), astronomer (P. G. GIOVANNOZZI).
PASSERINI, GIOV. (1816-1893), botanist (G. B. DE TONI).
PICCONE, ANT. (1844-1901), botanist (G. B. DE TONI).
REGALIA, ETT. (1842-1914) ethnologist (N. PUCCIONI).
SCHIAPARELLI, GIOV. VIRG. (1835-1910) astronomer (E. MILLOSEVICH).
STERZI, GIUS. (1876-1919), anatomist (G. FAVARO).
ZANARDINI, GIOV. (1804-1878) physician, botanist (G. B. DE TONI).

The various branches of science and the various periods are fairly well represented in this volume, although it is remarkable that one third of the scientists are botanists, and more than one third belong to the XIXth century. The editor should concentrate his effort on the older scientists, for it is exceedingly difficult to see a contemporary in his proper perspective. At any rate, we must be grateful to him for all that he is offering us, *and every encouragement should be given to him* in order that the undertaking may be carried on with reasonable speed.

The biography of ETTORE REGALIA by NELLO PUCCIONI (p. 196-202) is quoted neither in the table of contents, nor in the list of collaborators.

SARTON.

R. Paucot. — *Le rôle des sciences dans l'éducation*, 255 p. (180 × 120). Paris, A. COLIN, 1920. [6 fr. 50]

Il est vraiment étrange de constater que, tandis que la vie de l'homme est de plus en plus conditionnée par les applications des découvertes scientifiques, tandis que les différentes écoles philosophiques s'imprègnent de plus en plus de la pensée scientifique proprement dite, la place laissée à l'étude des sciences dans les programmes officiels d'instruction de nos pays d'Europe reste encore lamentablement mesurée. Mais le fait est là : si les mathématiques y ont depuis longtemps une place honorable, si leur valeur éducative est reconnue, les sciences physiques et naturelles ne sont entrées dans les programmes que par la petite porte, et ne sont guère enseignées que dans un but d'utilisation pratique, et non en vue de la culture intellectuelle qu'elles sont à même de développer.

Étant entendu que l'éducation doit armer l'enfant, l'adolescent et l'homme au triple point de vue physique, intellectuel et moral, on a jusqu'à présent considéré que le développement intellectuel et moral ne pouvait être le fait que d'une éducation littéraire, et il est certes bien peu d'établissements d'instruction où l'enseignement de la morale par exemple, soit confié à un professeur de l'ordre des sciences ; nous n'en connaissons qu'un pour notre part.

La place laissée aux études scientifiques est non seulement extrême-

ment réduite, mais encore souvent, dans l'enseignement primaire tout au moins, à l'âge où l'esprit d'observation est si vif, où pourrait se cultiver si utilement la mémoire visuelle dans les « leçons de choses », cet enseignement scientifique est en général très mal donné, en raison de la formation défectueuse des maîtres qui se trouvent chargés de la mission la plus délicate que la société puisse confier à des hommes.

M. Paucot demande dans son ouvrage une « collaboration » des lettres et des sciences à l'œuvre de l'enseignement. Il montre excellemment comment, selon l'âge et le développement intellectuel du travailleur, doivent être enseignées les mathématiques, les sciences physico-chimiques et la biologie pour fournir le meilleur rendement en vue de la culture générale des individus. Son livre ne renferme rien qui n'ait déjà été dit, mais ce déjà dit se trouve ici condensé sous une forme élégante, et exprimé avec une chaleur que nous aimerions à voir convaincre, et ceux qui enseignent, et plus encore ceux qui ont la grave mission d'élaborer les programmes d'instruction.

L. Guinet.

M. Leclerc du Sablon. — *L'unité de la science*, 284 p. (185×120). Paris, Félix Alcan (Nouvelle collection scientifique), 1919 [4 fr. 90]

Ensemble de considérations sur le principe de causalité, la causalité inverse, la non réversibilité des phénomènes, et les principes directeurs de l'arithmétique, de la géométrie, de la cristallographie, de la mécanique, de l'astronomie, de la physique, de la chimie, de la bioénergétique, de l'excitabilité de la matière vivante, de la morphologie et des sciences morales! Chacun de ces chapitres constitue à son tour une mosaïque un peu étrange de laquelle il est difficile de dégager une idée directrice autre que celle-ci : toute science a pour origine des observations sensorielles, s'édifie par application constante des deux postulats de causalité et de causalité inverse, auxquels l'intention de quelques hommes de génie ajoute d'autres postulats particuliers. De ci de là sont heureusement rappelés quelques points particuliers d'histoire de la connaissance scientifique telle par exemple celle des étapes de la découverte par Galilée de la loi de la chute des graves.

L. Guinet.

Fr. Houssay. [1860-1920]. — *Force et Cause*, 210 p. (185×120). Paris, E. Flammarion (Bibl. de philos. scientif.) 1920. [5 fr. 75]

On sait avec quel succès Fr. Houssay, allant plus avant dans la voie déterministe que ne le font les théories lamarckiennes, n'attendant de

l'animal « qu'une énergie motrice et une plasticité suffisantes », a introduit depuis vingt ans la méthode mécanique en biologie.

Ses principaux ouvrages : *La forme et la vie* (1900), *Nature et Sciences naturelles* (1907), *La morphologie dynamique* (1911), *Forme, puissance et stabilité des poissons* (1912), marquent, en dehors de ses communications aux sociétés savantes, les étapes parcourues, et ce dernier livre, de recherche théorique pure, peut être considéré comme le bréviaire des travailleurs dans cet ordre d'idées si fécond.

M. Houssay, hier encore Doyen de la Faculté des Sciences de Paris nous a donné dans son dernier livre : *Force et Cause* la trame essentielle de sa philosophie scientifique, et bien que l'esprit en soit fort différent, on ne peut se retenir de comparer ce petit livre à l'*Introduction à l'étude de la médecine expérimentale*, de Claude Bernard. C'est dire qu'en faire un compte-rendu fidèle est chose impossible : le moindre paragraphe est un sujet de méditation. Aussi nous contenterons-nous de suivre la Table des matières.

Le livre est divisé en deux parties dont la première a pour titre : « Connaissance et réalité ».

I. Les diverses formes de la connaissance. — II. Les idées et les faits : faits et objets résultent d'une discontinuité artificielle, sont des créations de notre esprit. — III. La connaissance scientifique : science ou sciences; la science est langage, elle est aussi pénétration du réel dans l'esprit. — IV. Les sciences naturelles : l'abstraction en biologie; le vivant, la forme individuelle, l'espèce; les combinaisons de ces concepts. — V. Le temps, l'espace et le mouvement : espace géométrique et espace mécanique; l'espace des phénomènes est réellement à quatre dimensions; sa décomposition en deux autres. — Vision et souvenir : cinématographie et méthode graphique. — Confusion ou distinction entre les deux espaces; la distinction s'impose en face des durées géologiques; la figuration du temps en stratigraphie; arbres généalogiques et évolution des formes. — VI. Les échelles du temps. Évolution et création : changements astronomiques et temps périodique, changements géologiques et temps évolutif; les deux sortes de temps sont pratiquement incommensurables; création évolutive et non évolution créatrice. — VII. Sur la causalité. Force et matière : force et cause; matérialime, idéalisme; dans le dynamisme, la masse est subordonnée, et la causalité apparaît sous la forme de la force : tous les phénomènes sont réductibles à la force dirigée. — VIII. La causalité en biologie : la réduction du continu en discontinu (les atomes biologiques) a échoué en biologie; la notion d'irréversibilité doit remplacer celle de contingence; le déterminisme scientifique s'oppose à toute idée de hasard, mais à rien d'autre; la science doit arriver à la

causalité en remontant la voie de l'efficience. — IX. La finalité en biologie : la finalité introduit les notions d'utile et de nuisible qu'ignore le déterminisme ; les thèses qui se réclament de DARWIN sont encore finalistes ; la recherche de l'efficience fait retrouver le déterminisme ; la finalité repoussée de chaque détail est reportée sur la synthèse terminale : la pensée primordiale, qui échappe à l'espace et au temps, qui est capable de produire une force, de la diriger, est à la fois efficiente et finale.

La seconde partie, intitulée « Le monde, la vie, la pensée », renferme, en un raccourci saisissant, un tableau brossé en grandes masses, des étapes par lesquelles est passé notre ancêtre arboricole et frugivore avant d'atteindre le stade d'homme actuel.

I. L'évolution de la vie et la réhabilitation d'énergie : si on n'étudie pas exclusivement l'animal supérieur adulte, la vie apparaît comme une réhabilitation d'énergie mécanique et d'énergie psychique. — II. Incarnation de l'énergie mécanique : les formes et les structures sont les conséquences et non les causes de la vie ; exemple de la forme des poissons, de la constitution des muscles et des fibres musculaires ; la constitution et le fonctionnement d'une forme animale, même compliquée, se ramènent à une succession physico-chimique et mécanique. — III. Sur l'énergie psychique : tandis que la plupart des actes vitaux sont des réactions physico-chimiques, on trouve chez les animaux supérieurs, en plus, la conscience et la pensée ; c'est une nouvelle réhabilitation d'énergie. — IV. Énergie psychique et individualité : équivalence de l'énergie psychique avec les autres énergies ; sa conservation. — V. Premiers effets de l'énergie psychique dans le régime frugivore : le régime frugivore tend à développer les qualités de prévoyance et d'ingéniosité ; notre ancêtre potier, boulanger et vigneron. — VI. Orientation des idées originelles par le régime alimentaire : des germinations se produisant dans les provisions de fruits et de graines, la notion de germe apparaît, qui se rattache au concept de vie ; génération et genèse ; création et créateur. — VII. L'évolution de la bonté : connaissance de la nature et réaction sentimentale ; l'élevage des jeunes crée des amitiés durables ; le don de soi dans la famille et dans la vie sociale ; l'examen cinématique des choses montre la bonté émergeant des luttes et des immolations ; certes, il reste encore du mal, mais la peine est la condition formelle de tout perfectionnement. — VIII. Évolution et progrès : vis-à-vis du progrès, l'évolution est oscillante. — IX. Progrès et adaptation. L'idée d'adaptation, la notion d'optimisme doit remplacer celle du progrès ; le seul indiscutable progrès est l'introduction de l'intelligence et de la bonté, et c'est là encore une réhabilitation d'énergie.

L. GUINET (Bruxelles).

Naville, Adrien. — *Classification des sciences. Les idées maîtresses des sciences et leurs rapports*, 3e édition, entièrement renouvelée, IV+322 p. Paris, ALCAN, 1920.

Les diverses classifications des sciences peuvent se diviser en deux groupes fondamentaux : les classifications objectives, c'est-à-dire celles qui insistent surtout sur la nature des objets dont traitent les sciences et les classifications subjectives, c'est-à-dire celles qui considèrent plutôt la part de l'esprit dans la création des disciplines. Les classifications de BENTHAM, d'AMPÈRE, d'ERNEST NAVILLE (le père d'ADRIEN), d'A. RAVA, et aussi celle de WUNDT appartiennent au premier groupe; tandis que celles de FRANÇOIS BACON, de D'ALEMBERT, de COMTE et de COURNOT appartiennent au second. La nouvelle classification d'ADRIEN NAVILLE (je dis nouvelle, car ses idées ont évolué sur ce sujet, et en 1877 il enseignait à Neuchâtel une classification tout autre), quoique profondément différente de celles de COMTE et de COURNOT, est aussi une classification subjective.

L'auteur considère qu'il y a trois questions scientifiques fondamentales : 1° quelles sont les possibilités conditionnées par les natures permanentes des choses et quelles sont les relations nécessaires entre ces possibilités? 2° quels sont les faits réels et quelles sont les possibilités concrètes conditionnées par ces faits? 3° quelles sont les possibilités bonnes? Ou plus brièvement : Qu'est-ce qui est possible? Qu'est-ce qui est réel? Qu'est-ce qui est bon? A ces trois questions, répondent trois classes de sciences : *a*) les sciences de lois, *Théorématique; b*) les sciences de faits, *Histoire; c*) les sciences de règles, *Canonique*. L'objet du livre est de développer cette classification. Je n'essayerai point de le résumer. L'examen des diverses branches de la science, et surtout des problèmes fondamentaux de chacune d'elles, donne à l'auteur maintes occasions de prouver la richesse de ses connaissances, la prudence de son esprit et la douce sagesse de son cœur. Je ne pense pas que les classifications des sciences soient fort utiles, mais si elles n'avaient d'autre utilité que de nous obliger à faire ainsi un examen d'ensemble des richesses intellectuelles qui sont le plus précieux patrimoine de l'humanité, elles justifieraient déjà leur existence. La lecture d'un livre comme celui-ci se recommande surtout aux jeunes étudiants; il les aidera puissamment à trouver leur voie dans la vie.

GEORGE SARTON.

Westaway, F. W. — ***Scientific Method.*** Its philosophy and its practice. New edition. XXIV+426 p.; ***Science and Theology.*** Their common aims and methods, XIV+346 p. London, BLACKIE, 1919-1920.

It is convenient to examine these two books together, for they have essentially the same purpose and much else in common. The first is more elementary and but little scientific knowledge is needed to understand it, while the other will be read with profit only by advanced students.

The first book is divided into four main parts:

1. *The philosophy of scientific method:* A short history of the philosophy of science, special chapters being devoted to SOCRATES, PLATO, ARISTOTLE, scholasticism, BACON, DESCARTES, LOCKE, HUME. Apropos of the latter the views of causation held by many other thinkers are discussed.

2. *The logic of scientific method :* An interesting study of the main logical problems involved in the elaboration of science. It is very concrete and very simple and is based chiefly upon the writings of WHEWELL, MILL, JOHN HERSCHELL, ALEX. BAIN, WILL. STANLEY JEVONS, WELTON, ALFRED SEDGWICK, of whom biographical sketches are given. It is a pity that these sketches are so meager; if introduced at all, they should have been far better.

3. *Famous men of science and their methods:* A series of extracts from scientific writings with brief introductory notes. The author gives examples first of scientific observation, then of various experiments of increasing complexity. These extracts are produced in the following order: WHITE of Selborne, A. R. WALLACE, DARWIN, Lord AVEBURY, HARVEY, WILL. CHARLES WELLS, BLACK, PRIESTLEY, GAY-LUSSAC, DAVY, BOYLE, NEWTON, FARADAY. These examples are certainly interesting and instructive, but their choice is not altogether satisfactory. The author should have been able to find a series of illustrations in which the methodological order was not so much at variance with the chronological order.

4. *Scientific method in the class room:* Elementary principles of scientific teaching and instances of investigations attempted by pupils.

In short, this book contains excellent stuff, and I recommend it to the teachers of elementary science and philosophy. They will find in it many interesting facts and suggestive thoughts (for ex. on p. 199, the criticism of NEWTON's optical research). But it is not on the whole a good book; the author himself could have given us a much better one if he had taken more trouble to compose it well. It

is a valuable collection of good pieces — some are excellent — poorly put together.

WESTAWAY's second book is far superior; though it falls short of being excellent because of a similar inadequacy in the general composition. One must fully admire the extensiveness and the soundness of his knowledge and the wisdom of which he gives many a proof, but the general plan of his work could have been improved and some discursiveness avoided. The book — considering its real date 1919, and the speed of discovery in our days — is remarkably uptodate. The best informed reader will find in it, explained in a clear and pleasant manner, some new information. Of course the fundamental objection to such a book is that it is suggestive only to the extent of the reader's previous knowledge. It is very difficult to imagine what it may convey to the mind of an ignorant theologian, and yet the author seems sometimes to assume that readers without scientific training may read it; I fear that to the untrained reader it would prove more dangerous than useful.

The purpose as defined in the preface, is: (1) to show on what evidence some of the fundamental principles of science have been established, and to make clear that these principles are provisional only; (2) to present a picture of the structure and evolution of the universe as conceived in the light of recent discoveries; (3) to show that modern science has become a great fundamental factor in human life and progress; (4) to show that permanent and final truth, whether in science or in theology, is very rare and very hard to come by and that what we call truth is usually an affair of a greater or less degree of probability; and finally (5) to appeal to each and every branch of the Christian church to abandon its claim to be the special favourites of heaven and to present a united front to the common enemy.

After a very careful reading of the book, I gladly acknowledge that the author's manifold purpose has been remarkably accomplished. However, I would have liked him to insist more upon the fact that our knowledge, if necessarily imperfect and provisional, is progressive. We cannot reach the absolute truth, but we come increasingly nearer to it. Science advances slowly but surely by a method of successive approximations, and judging from the incredible progress made during the last century, no one can imagine how much further we will be able to proceed in the future. If we could imagine our ignorance, we would already be less ignorant; we can only conceive it to the extent that we have overcome it.

The plan of the book is as follows: (1) The problems of philosophy; (2) Opinion and truth; (3) Matter; (4) Infinity, space and time; (5) Genesis of the Earth; (6) Evolution of animal species; (7) Evolu-

tion and antiquity of man; (8) Life and consciousness; (9) Instinct and intuition; (10) Probability; (11) Causation; (12) Theology and religion.

The author's theological conclusions are the broadest, and his insistence upon the fact that theology should be founded upon sound scientific knowledge and developed with the assistance of the true scientific spirit and methods is splendid. Says he (p. 343): « The important thing is for those in authority to keep themselves free from all moorings and afloat; to realize that religious truth has still to be found and their greatest duty of all is to devote their lives to the search for it. » That is splendid, but how many theologians will understand it? and of these, how many will have the energy and the perseverance to follow the author on his arduous path?

WESTAWAY concludes, on p. 110, that « the notion of infinite space conflicts with the conception of the universe as a whole, and the notion of infinite time with that of the universe as a process. All hypotheses of evolution imply that the universe had a beginning in time... » but he adds wisely at the end: « So far as space is concerned, RIEMANN's idea of space curvature may after all, form a clue to the ultimate solution of the problem. But time is admittedly one-dimensional, and no intelligible hypothesis which would enable us to form a conception of the *beginning* of time has yet been put forward. Yet nothing can be urged in favour of the infinity of time or space except a disability of our imperfect thought. At bottom, it is merely a question of a lack of correspondence between the constitution of our minds and that of the Universe. Why should we regard such a conflict as necessarily permanent? Why should not the conflict cease when in the course of ages, the human mind more closely approaches its evolutionary goal? » (1).

The chapter on Causation was largely rewritten on the appearance of C. A. MERCIER's book, *Causation and Belief*. « Modern conceptions of energy now make inevitable, however regretfully, the final abandonment of the main positions of HUME and MILL » (p. 279).

The lack of an index is to be deprecated; the author's theological friends will stand greatly in need of it. Select bibliographies are given at the end of each chapter, but without places and dates. The only blemish of this book is an irrelevant reference to COMTE on p. 15.

---

(1) Apropos of this I would remark : (1) with regard to time — that the notion of *periodical* evolution may help to reconcile the notions of evolution and infinity; (2) with regard to space — that EINSTEIN's theory implies the assumption of space curvature, that is, of a finite universe. WESTAWAY, writing in Nov. 1919, did not yet accept the theory of relativity.

The non-English reader should remember that the author uses the words billion, trillion, etc., according to English usage. In England a billion is 10^{12}, in France and America, 10^{9}. This confusion is very annoying. The author acknowledges his special debt to the late Lord RAYLEIGH, « whose invaluable help was most ungrudgingly given for many years. »

WESTAWAY's second book is very good indeed.

GEORGE SARTON.

Sand, René. *Organisation industrielle, médecine sociale et éducation civique en Angleterre et aux Etats-Unis*, 896 p. Bruxelles, LAMERTIN et Paris, BAILLIÈRE, 1920. [30 fr.]

This report which contains the results of Dr SAND's investigations in England and in the United States during the war is a fundamental contribution to the *organization* of social medicine and of positive polity and as such it deserves to be reviewed in *Isis*. It is really an encyclopædic survey, the more so that the author has added the essential bibliography of each topic to the record of his personal observations. Dr SAND is especially interested in the subject of social medicine, but it is of course impossible to draw the line on one side between social medicine and the organization of industry, and on the other, between social medicine and civic education. This determined the three main divisions of this book : Industry, Medicine, Education.

The very comprehensiveness of this survey makes it impossible even to quote the many topics which are dealt with. I think that more importance should have been given to the two following problems. In the first place, the sterilization of born criminals and other disgenic people should have been discussed more fully. In the second place, considering the primordial value of milk in human diet, it would have been worth while to explain with more detail the production and distribution of good milk in the great American cities. A paragraph should have been devoted to a discussion of the use of condensed and powdered milk. In the chapter dealing with orphans and abandoned children, I should have liked to find at least some reference to the growing practice among Americans to adopt children even when they already have many of their own. This trait of civic idealism is very characteristic. In the Latin countries adoption is considerably restricted by the *Code Napoléon*, whose chief object is the protection of personal property.

From the historical point of view, I have only two remarks to make. The statement on p. 548 : *l'introduction de la syphilis en Europe par les matelots de* CHRISTOPHE COLOMB is unwarranted ; as it is also irrele-

vant, it would have been wiser to leave it out. RAMAZZINI's *de morbis artificum diatriba* was first published in 1700, not in 1730. — It is a pity that many of the small diagrams are not more legible.

The reading of this book gave me great pleasure. It is gratifying to contemplate human achievements, but the planning of these achievements is far more gratifying. No field opens a brighter prospect of the future than social medicine. It is tremendously exciting to think of all the great things which could be done if scientific methods were more systematically applied to the solution of social problems and if the traditionnal politicians could be replaced by engineers and physicians.

It is interesting to anticipate the future of medicine along these lines. The nineteenth century had witnessed an increasing specialization of the medical profession and the gradual driving back of the general practitioner. But we now attend a new development : on the one hand, specialization becomes more and more necessary and new kinds of specialists are born every day ; on the other hand the notion of preventive medicine is constantly gaining ground as civic idealism develops. These two simultaneous tendencies, specialization and prevention, can but lead to an enormous development of the collective (*vs.* the private) practice of medecine. Only few people will have sufficient means to submit themselves periodically to the various *preventive* examinations which an increased enlightenment and a deeper sense of social duty will make more and more compulsory. As I see it, this will not decrease but on the contrary upraise the importance of the general practician, who will remain the trusted family adviser on all medical matters and will be the connecting link between the public and the numerous specialists. To be able to give sound advice to his clients and to send them in time to the proper specialist, the practitioner will require a solid medical and scientific training. It will no longer be necessary for him to know the practical details of many techniques, but on the other hand, he will need a more encyclopædic and deeper knowledge of the principles of every branch of medicine.

One must be thankful to Dr SAND for having written this excellent book. By doing so he has rendered a great service to the Latin countries, and also indirectly to the Anglo-Saxon world whose idealism is so often misunderstood. Dr SAND has not lost his time in discussing the reality and the value of their idealism ; he has preferred to oblige his reader to witness the immense amount of social service which this idealism has inspired. He has made it clear that poverty and misery will be defeated only by the alliance of civic idealism with scientific knowledge.

GEORGE SARTON.

Tenth Critical Bibliography

of the History, Philosophy and Organization of Science and of the History of Civilization

(to April 1921)

This Tenth Bibliography contains about 752 notes and refers to more than a thousand publications. It is not yet complete and on the other hand it contains the titles of various books or papers published many years ago. Thus, it is very far from being normal, although it marks a great progress upon the previous ones.

Some of the notes have been contributed by J. L. E. Dreyer (Oxford), L. Guinet (Brussels), L. C. Karpinski (Ann Arbor, Mich.), P. Masson-Oursel (Paris).

The arrangement and leading principles of this bibliography have been fully explained in *Isis* III, 159-171. The complete plan of classification follows. The reader will keep in mind that Part I is the fundamental classification and that Parts II and III contain only such items which could not be included in Part I because they deal with periods longer than two centuries (1). That is, Part II is only the residue of Part I, and Part III is only the residue of Parts I and II.

PART I. — Fundamental Classification (centurial).

..., S VIII A. C., S VII A. C., ..., S I A. C., S. I, S II, ..., S. XX.

The last subdivision is followed by a list of biographical, chiefly obituary, notices entitled « Materials for the biography of contemporary scientists and scholars ».

---

(1) Items dealing with periods longer than one century and shorter than three, are classified under one of the two centuries they deal with : the most important, or if equally important, the earliest.

PART II. — Historical Classification

1. Antiquity.
2. Antiquity, classical.
3. Asia (Central, Eastern, Western).
4. Babylonia and Assyria.
5. Bible (Old Test. civil).
6. Byzantium.
7. China.
8. Egypt.
9. Greece.
10. India.
11. Iran.
12. Islam.
13. Israel.
14. Japan.
15. Middle Ages.
16. Rome.

PART. III. — Systematic Classification

1. Anatomy.
2. Anthropology.
3. Archæology, museums and collections.
4. Art, art and science, iconography.
5. Arts and Crafts.
6. Astronomy, geodesy, meteorology and terrestrial physics.
7. Bibliography and libraries.
8. Biology.
9. Botany.
10. Chemistry.
11. Economics (econ. doctrines and hist., commerce, transportation, communications).
12. Education (methods and institutions.)
13. Ethnology, primitive and popular science.
14. Geography.
15. Geology, mineralogy, palæontology and mining.
16. History of civilization. Histor. methods, biography and chronology.
17. Language and literature.
18. Logic and theory of knowledge.
19. Mathematics.
20. Mechanics.
21. Medicine : *a*) Hist., Organisation and Philos.
    b) Epidemiology.
22. Morals. Moral organ. of society.
23. Pharmacy, pharmacology.
24. Philosophy. Science and philosophy.
25. Physics.
26. Physiology.
27. Prehistory.
28. Psychology.
29. Religion. Science and religion.
30. Science : *a*) Bibliography.
    b) History.
    c) Organization.
    d) Philosophy.
31. Sociology, jurisprudence and positive polity.
32. Statistics.
33. Superstitions and occultism.
34. Technology.
35. Zoology.
36. Alia.

I may add that I am preparing an " Introduction to the History and Philosophy of Science ", which will contain a critical and synthetic bibliography of the whole field (see *Isis*, IV, 23-31). When this Introduction is published (in 1923?) the Critical Bibliographies appearing in *Isis* will be, so to say, periodical supplements to it. It is hoped that the scholars who do not yet see the value of our classification, will understand it better when this Introduction will have enabled them to survey with comparative ease the whole field of scientific endeavour throughout the ages.

As my friend ALDO MIELI edits an excellent bibliography of Italian publications in his *Archivio di Storia della Scienza* (Roma, Nardecchia; vol. II, no 2-3 appeared in June 1921), — a bibliography which is also fundamentally chronological, — I will not duplicate his effort and will quote in my own bibliography only the most important Italian publications.

I am anxious to obtain the assistance of more collaborators in order that this bibliography be as good as possible. I would be especially grateful to scholars who would undertake to sub-edit one of the chapters, *ex. gr.* Greece, or Middle Ages, or astronomy, or botany. The best result would be obtained if every special chapter were edited by a specialist. But that would require teamwork of the first class, and the more so that Parts II and III should remain subordinate to Part I. There are still other ways to collaborate to this bibliography : one may undertake to analyze a certain number of periodicals, or else send in separate notes at random.

Scholars whose books or memoirs have not yet been included in this bibliography should not hasten to blame the editor. Did they send them to him? Or if they did, were their contributions pertinent? They should put themselves in the place of the editor whose chief aim is to establish the History of Science as an independent discipline and to serve best the scholars engaged in these studies. Critical work must be approached in a spirit of service or left untouched.

Cambridge, Mass. 24 Agassiz st.
May 19, 1921 GEORGE SARTON.

PART I

—

Fundamental Classification (centurial)

S. IX. A.C.

Allen, Thomas William. The Homeric catalogue of ships edited with a commentary [*Iliad*, II, 494-877], XI + 191 p. Oxford, CLARENDON Press, 1921. 1818

Wilamowitz-Moellendorff, Ulrich von. Die Ilias und HOMER, VI + 524 S. Berlin, WEIDMANN, 1916. 1818

S. V. A.C.

Beardslee, John Walter (jr.). The use of φύσις in fifth century Greek literature (*Thesis*), 126 p. Chicago University Press, 1918. 1818

Diels, H. Hippokratische Forschungen. V. Eine neue Fassung des XIX HIPPOKRATESBriefes. *Hermes*, Bd. 53, p. 57-87. Berlin, 1918. 1818

Fotheringham, J. K. A neglected eclipse. *The Observatory*, vol. 43, p. 189-191, 1920. 1818

The total eclipse of — 462 April 30, alluded to by PINDAR. J. L. E. D.

Halliday, W. R. The first description of a Lake-Village. *Discovery*, vol. I, p. 235-238. London, 1920. 1818

This description is found in HERODOTUS (V. 16); it is probably the only first-hand description from life of one of the lake-villages of the Central European type exactly similar to those in which the ancestors of the Romans must once have lived. HALLIDAY gives a general account of lake-villages with bibliography. G. S.

Murray, Gilbert. ARISTOPHANES and the war party. A study in the contemporary criticism of the war party (The CREIGHTON lecture, 1918). 48 p. London, ALLEN, 1918. 1818

The American ed. of the same book is entitled : *Our great war and the great war of the ancient Greeks.* New York, SELTZER, 1920. G. S.

Obst, Ernst. Die Beschreibung des Nilpferdes bei HERODOT II, 71. *Klio*, t. 14, p. 390-391. Leipzig, 1914. 1818

Pohlenz, Max. Zu den hippokratischen Briefen. *Hermes*, t. 52, 348-353. Berlin, 1917. 1818

Based upon Papyri Berol. 6934 and 7094 of the II/III cent. and Pap. Ox. IX, 1184 of the time of TIBERIUS. G. S.

Pohlenz, M. Das zwanzigste Kapitel von HIPPOKRATES *de prisca medicina*. *Hermes*, Bd. 53, p. 396-421. Berlin, 1918. 1818

Westberg, Fr. Zur Topographie des HERODOT, III, 7, Herodots Stadion. *Klio*, t. 14, p. 338-344. Leipzig, 1914. 1818

Conclusion : Herodotus' stadium = 148,85 m. G. S.

Zilles, W. Hippias aus Elis. *Hermes*, Bd. 53, p. 45-56. Berlin 1918. 1918

Information on the life and activity of Hippias the sophist, supplementing that given by Gomperz. No reference to his mathematical work. G. S.

S. IV A. C.

Bitterauf, Karl E. Der Schlussteil der Aristotelischen Biologie. Beiträge zur Textgeschichte und Textkritik der Schrift *de generatione animalium*. (*Progr.*), 48 p. Kempten im Allgäu, 1913. 1918

A second part, which I have not seen, has been published *ibidem* 1914, 33 p. G. S.

Cajori, Florian. Aristotle and Galileo on falling bodies. *Science*, t. 51, p. 615-616, 1920. 1918

Cajori discusses fully Aristotle's ideas on the subject. G. S.

Herzog, M. A. Aristoteles' Anschauungen über die Lehre von Winterschlaf im Vergleich zu unsern heutigen Kenntnissen. Festschrift für Zschokke, n° 41, 28 p. Basel, 1920. 1918

An elaborate study of Aristotle's views on hibernation followed by a summary of modern ideas on sleep and winter sleep, and a bibliography. G. S.

Mathieu, Georges. Aristote. Constitution d'Athènes. Essai sur la méthode suivie par Aristote dans la discussion des textes. (Bibliothèque de l'école des hautes études, sci. histor. et philol., fasc. 216), VII + 137 p. Paris, Champion, 1915. 1918

Taylor, Alfred Ewart. Aristotle (The People's Books). Revised ed., 126 p. Edinburgh. Jack, 1919. (First ed. 1912). 1918

Wellmann, M. Eine pythagoreische Urkunde des IV. Jahrhunderts v. Chr. *Hermes*, Bd. 54, p. 225-248. Berlin, 1919. 1918

Apropos of a text quoted by Diogenes Laertius (VIII, 25 sq.), which has not received sufficient attention, because it is anonymous. Zeller alone (*Phil. der Griechen*, III, 2[4], p. 103 sq.) has seen its importance, but he has erroneously attributed it to the last quarter of the second century. Wellmann maintains that it is a Pythagorean writing of the 4th cent. B. C. He gives the full text. G. S.

S. III A. C.

Archibald, R. C. The cattle problem of Archimedes. *The American mathematical monthly*, vol. 25, p. 411-414, 1918. 1918

Bosmans, H. Sur les recherches relatives à l'histoire de la formation des Eléments d'Euclide, à propos des derniers travaux de Zeuthen. *Revue des questions scientifiques*, 11 p. Bruxelles, avril 1920. 1918

Caspari, Fritz. Das Nilschiff Ptolemaios IV. *Jarbuch des Kaiserlich deutschen archäologischen Instituts*, Bd. 31, p. 1-74, 1 pl. Berlin 1916. 1918

Apropos of the immense floating palace built for PTOLEMY PHILOPATER (221-205) and described by CALLIXENUS of Rhodes, his contemporary (ATHENAEUS, V). G. S.

Jastrow, Morris (jr.). A gentle cynic : being a translation of the book of Koheleth, commonly called *Ecclesiastes*, stripped of its later editions; also its origin, growth and interpretation, 255 p. Philadelphia, LIPPINCOTT, 1919. 1818

Heath, Sir Thomas L. EUCLID in Greek. Book I, with introduction and notes, x + 240 p. Cambridge University Press, 1920. 1818

Payn, H. The well of ERATOSTHENES. *The Observatory*, vol. 37, p. 92-98, 1 pl., 1914. 1818

A picture of a well on the island of Elephantine. J. L. E. DREYER (*ibidem*, p. 352-353), shows that the well cannot have had any connection with ERATOSTHENES. J. L. E. D.

S. II A.C.

Erkes, Eduard. Das Weltbild des HUAI-NAN-TZE. *Ostasiatische Zeitschrift*, V, p. 27-80, 13 Abb. Berlin 1917. 1818

HUAI-NAN-TZŬ, the last early Taoist philosopher, died in 122 B. C. He wrote a compilation in 21 books, of which book IV dealing with the surface of the earth, is here translated with copious annotations The illustr. are photographs of the Chinese text. G. S.

Feldhaus, F. M. Eine phantastische Wasseruhr. *Geschichtsblätter für Technik*, t. II, p. 22-24, 143-144, mit Abb. Berlin, 1915. 1818

About the monumental but fanciful reconstruction of CTESIBIUS' water clock in « Deutschen Museum », Munich. This model is 3.50 m. high ; its mechanism is entirely modern. G. S.

Fotheringham, J. K. The secular acceleration of the sun as determined from HIPPARCHUS' equinox observations, with a note on PTOLEMY'S false equinox. *Monthly notices of the R. astronomical soc.*, vol. 78, p. 406-423, 1918. 1818

Discusses 20 equinox determinations made by HIPPARCHUS and compares them with NEWCOMB'S tables of the Sun. J. L. E. D.

Fotheringham, J. K. The new star of HIPPARCHUS and the dates of birth and accession of MITHRIDATES. *Monthly not. of the R. astron. soc.*, vol. 79, p. 162-167, 1919. 1818

This new star is identical with the comet of B. C. 134, said by JUSTIN to have heralded the conception of MITHRIDATES, while another comet which appeared at his accession was seen according to a Chinese source in B. C. 120. J. L. E. D.

Lippmann, Edm. O. von. Geschichtlicher Beitrag zur Erkenntnis der Verbrennungsvorgänge. *Z. für angew. Chemie*, Bd. I, Dez. 1920. 1818

Shows that the ancient knew that air is indispensable to the process of combustion. Deals chiefly with PHILO of Byzantium. G. S.

[Philo of Byzantium.] Philons Belopoiika (viertes Buch der Mechanik) Griechisch und Deutsch von H. Diels und E. Schramm. Mit 8 Tafeln. 68 S. *Abhdl. d. Preuss. Ak. d. Wiss., philos.-hist. Klasse*, nr 16. Berlin, 1919. 1918

The Greek text is based upon that published by Richard Schoene. Philo's treatise on war engines is far less clear than Hero's but has the advantage of containing measurements of the machines described. The authors have taken special pains to insure the correctness of their translation from the technical point of view. The plates are very good; six of them are borrowed from E. Schramm, *Die antiken Geschütze der Saalburg*, Berlin 1918. G. S.

Viedebantt, O. Der athenische Volksbeschluss über Mass und Gewicht. *Hermes*, 51 Bd., p. 120-144. Berlin 1916. 1918

New study of the inscription CIG, 123, of the end of the second cent. B. C. G. S.

S. I A. C.

Diels, H. Lukrez studien. II, III. *Sitzungsber. d. preuss. Akad. d. Wiss.*, 2-18. Berlin, 1920. 1918

Mussehl, J. Uber eine Aporie in der Lehre von den Aggregatzuständen bei Lukrez (II, 444-477). *Hermes*, Bd. 53, p. 197-210, Berlin, 1918. 1918

Preisigke, Friedrich und **Spiegelberg, Wilh.** Die Prinz Joachim Ostraka. Griechische und demotische Beisetzungsurkunden für Ibis- und Falkenmumien (*Schriften d. wissensch. Gesell. in Strassburg*, 19. Heft), VII + 69 S., 4 T., 1914. 1918

Stern, E. von. Bemerkungen zu Strabons Geographie der taurischen Chersonesos (mit einer Kartenskizze) *Hermes*, Bd. 52, p. 1-38. Berlin, 1917. 1918

S. I

Charles, Robert Henry. A critical and exegetical commentary on the revelation of St. John. 2 vol. (International critical commentary). New-York, Scribners, 1920. 1918

Dessau, H. Uber die Abfassungszeit einiger Schriften Senecas. *Hermes*, t. 53, p. 188-196. Berlin, 1918. 1918

Foakes-Jackson, Frederic John and **Lake, Kirsopp.** The beginnings of Christianity. Part I. The Acts of the Apostles. Vol. I. Prolegomena. I, The Jewish, Gentile and Christian backgrounds. XI+480 p. London, Macmillan, 1920. 1918

Holland, Francis Caldwell. Seneca, 206 p. London. Longmans 1920.

Manilius. Astronomica edidit Jacobus van Wageningen, XXVI + 196 p. Leipzig, Teubner, 1915. 1918

Translation into Dutch of the same work by the same author. Leiden, Brill, 1914 (not seen). G. S.

Meyer, Eduard. Apollonios von Tyana und die Biographie des Philostratos. *Hermes*, Bd. 52, p. 371-424, Berlin, 1917. 1818

Meyer's conclusion is that Apollonius was a personality of no importance in his time. The main writers of the second century ignore him, Lucian refers to him with contempt. His fame is due entirely to Philostratus' romantic biography. — This conclusion is of course not new, but it is interesting to have it restated by Eduard Meyer. G. S.

Mutschmann, Hermann. Seneca und Epikur. *Hermes*, Bd. 50, p. 321-356. Berlin, 1915. 1818

Nachmanson, Ernst. Erotianstudien. (Arbeten utg. med understöd af Vilhelm Ekmans universitetsfond, 19), xv + 574 p. Uppsala 1917. 1818

Neuburger, Max. Die Medizin im Flavius Josephus, 74 p. Bad Reichenhall, 1919. 1818

Summers, Walter Coventry. The silver age of Latin literature from Tiberius to Trajan, xii + 323 p. London, Methuen, 1920. 1818

Wellmann, M. Pamphilos. *Hermes*, t. 51, p. 1-64, Berlin, 1916. 1818

Study of the sources of Claudius Aelianus' περὶ ζώων ἰδιότητος. G. S.

Wissowa, Georg. Die Abfassungszeit der Chorographia des Pomponius Mela. *Hermes*, 51 Bd., p. 89-96. Berlin. 1916. 1818

S. II

Dreyer, J. L. E. On the origin of Ptolemy's catalogue of stars. *Monthly notices of the R. astron. soc.*, vol. 77, p. 528-539, 1917: vol. 78, p. 343-349, 1918. 1818

It was not borrowed from the catalogue of Hipparchus which only contained about 850 stars nor from observations made by Menelaus. — The error of a degree in the longitudes of Ptolemy's catalogue was caused by an error in his equinox due to his having adopted too large a value of the length of the tropical year. The declinations of 18 stars given by Ptolemy were certainly observed by him. J. I. E D.

Fischer, Jos. Die Stadtzeichen auf den Ptolemäuskarten. *Kartographische und schulgeographische Zeitschrift*, VII. Jahrg., p. 49-52, 3 Fig. Wien, 1918. 1818

Fischer, Jos. Pappus und die Ptolemäus karten. *Zeitschrift der Gesellschaft für Erdkunde*, Berlin, 1919, p. 336-358. 1818

In 1881 father Arsène Soukry published in Venice the « *Géographie de* Moïse *de Corène*, d'après Ptolémée. Texte arménien traduit en français. » This Armenian Moses fl. ab. 440 according to Soukry, but other authors would consider his Geography as an apocryphal writing of the viiith, ixth or even xth century. At any rate this Armenian geography is based upon a lost work of Pappus. The Rev. Dr Jos. Fischer contends that Pappus, who fl. but a little more than a century later than Ptolemy and was working in the same place and along the same lines as his great predecessor, actually used Ptolemy's maps. He proves it by comparing Moses' (that is Pappus') text with the Ptolemaic maps. G. S.

Fotheringham, J. K. and **Longbottom**. The secular acceleration of the Moon's mean motion as determined from the occultations in the Almagest. *Monthly Notices of the R. astronomical soc.*, vol. 75, p. 377-394, 1915. 1818

See *ibidem*, p. 397-398, note by E. B. KNOBEL : the earliest use of one of these occultations was by N. GREENWOOD is his *Astronomia Anglicana*, 1689; also p. 589, note by J. K. FOTHERINGHAM on SCHJELLERUP'S discussion of the occultations in the ALMAGEST (in *Copernicus*, I, p. 25-39, 1881); E. NEVILL. On the conjunctions of stars with the Moon recorded by PTOLEMY (calls attention to SCHJELLERUP'S discussion); p. 716, reply by FOTHERINGHAM. J. L. E. D.

Fotheringham, J. K. Ancient observations of coloured stars. *The Observatory*, vol. 43, p. 191-192, 1920. 1818

Review of a paper by FRANZ BOLL on the starcolours described in PTOLEMY'S *Tetrabiblos* and other ancient writings. J. L. E. D.

Heilmann, G. Uber die ägyptischen Witterungsangaben im Kalender von CLAUDIUS PTOLEMAEUS *Sitzungsber. d. Kgl. preuss. Akad. d. Wiss.*, p. 332-341. Berlin, 1916. 1818

Heimreich, G. Handschriftliche Verbesserungen zu dem HIPPOKRATES-glossar des GALEN. *Sitzungsber. d. Kgl. preuss. Ak. d. Wiss.*, p. 197-214. Berlin, 1916. 1818

Pelliot, Paul. MEOU-TSEU ou les doutes levés. Traduit et annoté. *T'oung Pao*, vol. XIX, p. 255-433. Leide, 1920. 1818

MEOU-TSEU probablement né vers 165-170 à T'sang-wou, où se trouve actuellement Wou-tcheou sur le Si-Kiang, s'était retiré au Tonkin avec sa mère sans doute dès avant 189. Dès son séjour au Tonkin, semble-t-il, il s'était épris du bouddhisme. PAUL PELLIOT traduit ici un petit traité d'apologétique bouddhiste qui lui est attribué. Cette traduction est accompagnée d'une longue introduction (p. 255-286) et de notes copieuses (p. 326-433). PELLIOT pense que le Meou-tseu date de la fin du II^e^ siècle, sans exclure tout à fait l'hypothèse d'un faux ultérieur (IV^e^ ou V^e^ siècle). D. TOKIWA (1920) avait conclu indépendamment que c'est un faux du V^e^ siècle — On sait que le Bouddhisme fut probablement introduit en Chine au I^er^ siècle de notre ère. G. S.

Platnauer, Maurice. The life and reign of the emperor SEPTIMIUS SEVERUS [146-211, emperor 193-211], VI + 221 p. Oxford, University Press, 1918. 1818

Schöne, Hermann. τὸ τοῦ Τραϊανοῦ γυμνάσιον bei GALENOS. *Hermes*, Bd. 52, p. 105-111. Berlin, 1917. 1818

Apropos of the gymnasium of TRAJANUS mentioned in GALEN'S Θεραπευτικὴ μέθοδος, XIII, c. 15 (X, p. 909-916, Kühn). This gymnasium must be the *thermae* constructed under TRAJANUS by APOLLODORUS of Damascus. G. S.

Tudeer, Lauri O. Th. On the origin of the maps attached to PTOLEMY'S geography. *Journal of Hellenic Studies*, t. 37, p. 62-76, London, 1917. 1818

Wenkebach, Ernst. Pseudogalenische Kommentare zu den Epidemien des HIPPOKRATES. *Abh. d. Kgl. preuss. Akad. d. Wiss., philos.-hist. Klasse*, Jahrgang 1917, n^r^ 1, 62 p. Berlin, 1917. 1818

The text included in KÜHN's ed., t. 17, 313-462 (GALEN's commentary to the 2nd. book on epidemics) is a cento of the XVIth or XVIIth century made up of quotations from HIPPOCRATES and GALEN and of others translated from FOES' Latin commentaries of 1560 and 1588. This text should be excluded from the Corpus Medic. Graec. G. S.

Wenkebach, Ernst. Das Proömium der Kommentare GALENS zu den Epidemien des HIPPOKRATES. *Abhdl. d. Kgl. preuss. Akad. d. Wiss., philos.-hist. Kl.*, 55 p., nr. 8. Berlin, 1918. 1815

Wenkebach, Ernst. Eine alexandrinische Buchfehde um einen Buchstaben in den hippokratischen Krankengeschichten. Ein unveröffentliches GALENkapitel. *Sitzungsber. d. preuss. Akad. d. Wiss.*, p. 241-253. Berlin, 1920. 1816

S. III

Fischer, Jos. PAPPUS und die PTOLEMÄUSkarten, *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, p 336-358, 1919. 1818

See analysis under S. II.

S. IV

Alfaric, Prosper. L'évolution intellectuelle de saint AUGUSTIN. Tome I. Du manichéisme au néoplatonisme, IX+556 p. Paris, NOURRY, 1918. 1818

Bidez, J. L'évolution de la politique de l'empereur JULIEN en matière religieuse. *Bull. de l'Acad. roy. de Belgique* (classe des lettres) n° 7, p. 406-461. Bruxelles, 1914. 1818

Explains on first-hand evidence religious evolution at a fateful hour, justifies JULIAN against those who slandered him and shows that his efforts were not vain. G. S.

Haarhoff, Theodore. The schools of Gaul. A study of pagan and Christian education in the last century of the Western empire. Oxford University Press, 1920. 1818

Mackean, W. H. Christian monasticism in Egypt to the close of the fourth century. Studies in church history, 160 p. London, Society for promoting Christian knowledge, 1920. 1818

After two introductory chapters dealing respectively with « Christian monasticism and non-Christian ascetic systems (Indian, Greek, Egyptian, Jewish) », and « the origin of Christian monasticism in Egypt », the author makes a closer study of the various types and aspects of Egyptian monasticism, chiefly in the IVth century, and of its spread. Bibliography and index. G. S.

Nemesii Episcopi Premnon physicon sive περὶ φύσεως ἀνθρώπου liber a N. ALFANO archiepiscopo Salerni in latinum translatus, recognovit CAROLUS BURKHARD, XII + 154 p. Leipzig, TEUBNER, 1917. 1818

S. VI

Diels, H. Ueber die von PROKOP beschriebene Kunstuhr von Gaza. Mit einem Anhang enthaltend Text und Uebersetzung der ἔκφρασις

ὡρολόγιου des PROKOPIOS von Gaza. *Abh. d. Kgl. preuss. Akad. d. Wiss., philos.-hist. Kl.*, nr 7, 39 p., 2 pl. Berlin, 1917. 1918

The description of the clock of Gaza by PROCOPIUS (this text was formerly attributed to CHORIKIUS) is particularly interesting, meager as it be from the technical point of view, because it is one of the last monuments of Greek art and ingenuity, and because it marks a transition between the clocks of CTESIBIUS and the Christian and Islamic clocks. PROCOPIUS is to be placed between 473 and 535, for he seems to have died before 536. DIELS has tried to reconstruct the clock of Gaza. G. S.

S. VII

Helmreich, G Handschriftliche Studien zu MELETIUS. *Abhdl. d. Kgl. Preuss. Ak. d. Wiss., J. 1918, philos.-hist. Kl.*, nr. 6, 62 p. Berlin, 1918. 1918

The περὶ φύσεως ἀνθρώπου of the Phrygian monk MELETIUS was published in 1836, by CRAMER (*Anecd. graec. Oxon.*, III, p. 1-157) but this edition is not satisfactory. HELMREICH publishes here the results of research preparatory to a new edition. At the end of his memoir he gives lists of the words borrowed by MELETIUS from NEMESIUS, GALEN, GREGORY OF NYSSA, BASILIUS, GREGORY NAZIANZEN. According to VOIGT and WINTER (as quoted in NEUBURGER and PAGEL'S *Handbuch d. Gesch. d. Med.*, t. I, p. 558) MELETIUS the monk fl. between 600 and 800. G. S.

With, Karl. Buddhistische Plastik in Japan, bis in den Beginn des 8. Jahrhunderts n. Chr. Textband mit 28 Abbild., 207 S.; Tafelband mit 224 Taf. nach eigenen Aufnahmen des Herausgebers, Gr.-4°. Wien, SCHROLL, 1919. 1919

This study of early Japanese sculpture down to the beg. of the Tempyô does not reveal monuments not yet published in Japan, but it is valuable because of the many illustrations relating to sculptural details and also because it is extremely handy. The text consists mainly of a description and stylistic analysis of each plate. The subject is divided as follows: (I) First half of VIIth century; (II) Second half of VIIth century; (III) First half of VIIIth century. — This is to my knowledge, the first complete analysis of pre-Tempyô sculpture published in Europe. G. S.

S. VIII

Browne, George Forrest [1833-]. The venerable BEDE. His life and writings, 327 p., 20 pl. Society for the promotion of Christian knowledge. London, 1919. 1919

This life by Bishop BROWNE first appeared in 1879. G. S.

Lindsay, Wallace Martin. Notae latinae. An account of abbreviation in Latin MSS. of the early minuscule period (c. 700-850); XXIV+500 p. Cambridge University Press, 1915. 1918

S. IX

Lehmann, Paul. Zur Kenntnis und Geschichte einiger JOHANNES SCOTTUS zugeschriebener Werke. *Hermes*, Bd. 52, p. 112-124, Berlin, 1917. 1918

(I) Die Disputatio Iohannis Scotti cum Theodoro Graeco und die Clavis physicae des Honorius Augustodunensis; (II) De egressu et regressu animae ad Deum, de visione Dei und die Uebersetzung der Ambigua Maximi; (III) Aus der Bibliothek eines Freundes des Johannes Scottus. G. S.

S. X

[Fârâbi, al. b. at Fârâb (*i.e.* Otrar), Turkestan, ab. 870 — died in Damascus. 950-951]. Alfarabi über den Ursprung der Wissenschaften (*de ortu scientiarum*), hrg. von Clemens Baeumker. *Beiträge zur Geschichte der Philosophie des Mittelalters*, XIX, 3. 32 p. Münster i. W., 1916. 1818

Text of the Latin translation most probably by Dominicus Gundissalinus, archdeacon of Segovia (middle of xiith cent.) : Liber Alpharabii de ortu scientiarum. Epistola de assignanda causa ex qua ortae sunt scientiae philosophiae et ordo earum in disciplina. Introduction of 13 p. G. S.

S. XI

Wilhelm, Friedrich. Denkmäler deutscher Prosa des 11. und 12. Jahrhunderts. Mit Kommentar und Einleitung versehen. 2 vol. (Münchener Texte, 8), München, Callwey, 1914-1918. 1818

S. XII

Lippmann, Edmund O. von. Zur Geschichte des Alkohols. *Chemiker-Zeitung*, nr. 102. 1920. (Reprint, 1 1/2 p.) 1818

Completing previous notes on same subject, see *Isis* III, p. 322, 323, 324. The oldest mention of alcoholic distillation is found in the writings of the so-called Magister Salernus who died in 1167. Now the great Breslau *Compendium of Salernitan medicine* compiled between 1160 and 1170 contains various references to the distillation of rosewater by means of a *cucurbita* and a *vas duplex* (= *bain-marie*), but no reference whatever to *aqua ardens*. Sudhoff had concluded that alcohol was not known in Salerno until the second half of xiith. century. Lippmann concludes that it is the distillation of rosewater which suggested that of fermented beverages. G. S.

Pardi, G. L'Italia nel XII secolo descritta da un geografo arabo (Memorie geografiche di Giotto Dainelli, suppl alla *Rivista geografica italiana*, n. 38), p. 59-171. Firenze, 1919. 1818

Edrisi's description of Italy, arranged state by state. G. S.

Rohner, A. Das Schöpfungsproblem bei Moses Maimonides, Albertus, Magnus und Thomas von Aquin. (*Beiträge zur Geschichte der Philosophie des Mittelalters*, XI, 5), xii + 140 p. Münster i. W., 1913. 1818

Schneider, Artur. Die abendländische Spekulation des 12. Jahrhunderts in ihrem Verhältnis zur aristotelischen und jüdisch-arabischen Philosophie. (*Beitr. zur Gesch. d. Phil. d. Miltelalters*, XVII, 4), viii + 76 p. Münster i. W. 1915. 1818

Smith, D. E. and Ginsburg, J. Rabbi ben Ezra and the Hindu-Arabic Problem, *American mathemathical monthly*, XXV, p. 99-108, 1918. 1818

English translation of ABRAHAM IBN EZRA'S introduction to his own Hebrew translation of AL-BIRUNI'S work on AL-KHOWARIZMI'S tables. This gives interesting early views about the introduction among the Arabs of Hindu science. L. C. K.

S. XIII

Albertus Magnus. De Animalibus libri XXVI nach der Cölner Urschrift, hrg. von HERMANN STADLER. 2 vol. (*Beitr. zur Gesch. d. Philos. d. Mittelalters*, Bd. 15 u 16). Münster i. W. 1916-1920. 1918

Asin Palacios, Miguel. La escatologia musulmana en la Divina Comedia, 403 p. Madrid, E. MAESTRE, 1919. 1918

[Bacon, Roger] Opera hactenus inedita ROGERI BACONI. Fasc. V. Secretum secretorum, cum glossis et notulis. Tractatus brevis et utilis ad declarandum quedam obscure dicta fratris Rogeri. Nunc primum edidit ROBERT STEELE. Accedunt versio anglicana ex arabico edita per A. S. FULTON, versio vetusta anglo-normanica nunc primum edita, LXIV + 318 p Oxford, CLARENDON Press, 1920. 1918

Baur, Ludwig. Die Philosophie des ROBERT GROSSETESTE, Bishofs von Lincoln († 1253). (*Beitr. zur Gesch. d. Mittelalters*, XVIII, p. 4-6), XVI + 298 p. Münster i. W. 1917. 1918

Bridges, John Henry. [1832-1906]. The life and work of ROGER BACON, with additions and notes by H. GORDON JONES, 173 p. London, WILLIAMS and NORGATE, 1914. 1918

Amplified ed. of BRIDGES' introduction to the OPUS MAJUS, 1897.

Cordier, Henri. Ser MARCO POLO. Notes and addenda to Sir HENRY YULE'S edition, containing the results of recent research and discovery. X + 161 p. New York, SCRIBNER, 1920. [4 s] 1918

In 1903, HENRI CORDIER edited the third edition of Sir HENRI YULE'S (1820-1889) monumental translation of the Book of Ser MARCO POLO He now offers us as a supplement to this edition, all the notes he has indefatigably collected on the subject within the last seventeen years. For ex., he has taken full advantage of the new knowledge obtained by Sir AUREL STEIN, SVEN HEDIN, PELLIOT, KOZLOV in their expeditions, and his own studies — especially his second ed. of YULE'S *Cathay and the Way Thither* — have enabled him to gather all the information which was worth gathering, and even more. For this learned volume has unfortunately the defects of its qualities : supercommentaries are likely to be excessive; all of CORDIER'S notes are not equally relevant and important and they take us further and further away from the delightful memoirs which they are supposed to illustrate. G. S.

Dantis Alagherii Epistolae. The letters of DANTE. Emended text with introduction, translation, notes and appendix on the cursus by PAGET TOYNBEE, LVI + 305 p. Oxford, CLARENDON Press, 1920. 1918

Critical edition without the diplomatic transcriptions already published by the author in the *Modern Language Review*, 1912 to 1919. The introduction deals with the history of the letters from the XIVth century to the present day. This edition contains the text of ten letters, 1304 to c. 1319.

The spurious letter to GUIDO da Polenta, 1314 is given in Appendix A — Appendix B is a chronological table from DANTE'S Priorate (1300) to his death (1321) : *De vulgari eloquentia* probably written in 1304; *Convivio* probably finished by Nov. 1308; *Inferno*, *Purgatorio* and ten *cantos* of the *Paradiso* completed in 1319; *De aqua et terra*, Jan. 20, 1320; Sept. 14, 1321, death at Ravenna. — Excellent indexes. G. S.

Dreyer, J. L. E. On the original form of the Alfonsine Tables. *Monthly notices of the R. astron. soc.*, vol. 80, p. 243-262, 1920. 1918

The tables in their original form have never been printed and have been quite forgotten, but they are shown to exist in a number of MSS. in this country. The tables of mean motions are printed in this paper.
J. L. E. D.

Grabmann, Martin [1875-] Forschungen über die lateinischen Aristoteles-Uebersetzungen des XIII Jahrhunderts. (*Beitr. zur Gesch. d. Philos. d. Mittelalters*, XVII, 5-6), XXVII + 270 p. Münster i. W. 1916. 1918

Henricus Dacus (= HENRIK HARPESTRENG, d. 1244). De simplicibus medicinis laxativis. Udgivet for förste gang af J. W. S. JOHNSSON. 98 p. Köbenhavn, VILHELM PRIORS Kgl. Hofboghandel, 1914. 1918

First edition of the Copenhagen MS. G. K. S. 1654, 4° attributed to HENRICUS DACUS, whom the learned editor was able to identify with HARPESTRENG. The text of the *de simplicibus* is followed by a copious commentary (in Danish), p. 49-95, and by a bibliography. Two pages of the MS. are reproduced in fac-simile. See *Isis*, IV, 13. G. S.

Wicksteed, Philip Henry [1844-]. The reactions between dogma and philosophy. Illustrated from the works of St. THOMAS AQUINAS, XXVI + 670 p. London, WILLIAMS and NORGATE, 1920. 1918

Wiedemann, Eilhard. Ueber ein arabisches, eigentümliches Wasserrad und eine Kolhenwasserhaltige Höhle auf Majorka nach AL QAZWĪNĪ. *Mitt. zur Gesch. d. Medizin*, t. 15, p. 368-370. Leipzig, 1916. 1918

S. XIV

Diels, H. Uber die Schrift Antipocras des NIKOLAUS von Polen. *Sitzungsber. d. Kgl. preuss. Akad. d. Wiss.* p. 376-394. Berlin, 1916. 1918

To complete what I have said in *Isis* III, 327. This text by the Dominican friar who was teaching in Montpellier in the beginning of the XIVth century, is here completely re-published by DIELS (p. 379-394, 427 verses with a short preface in prose) : « Incipit Antipocras, quem composuit et similiter noncupavit frater NICHOLAUS fratrum predicatorum. Alio autem nomine appellatur liber empiricorum ». G. S.

Emerton, Ephraim. The Defensor Pacis of MARSIGLIO of Padua [d. 1342] A critical study. 81 p. Cambridge, Mass. HARVARD University Press, 1920. 1918

Favaro, Antonio. PIETRO d'Abano ed il suo « Lucidator astrologiae ». *Atti del R. Istituto Veneto*, t. 75, p. 2 da, p. 515-527. Venezia, 1916.

The *Lucidator* dates of 1310, that is, PIETRO wrote it later than his *Conciliator* (1303), towards the end of his life which occurred in 1315. He was professor of medicine, philosophy and astrology at the University of Padova. FAVARO discusses DUHEM'S judgment of PIETRO in his *Système du Monde*, vol. IV. G. S.

Hamd-Allāh, Mustaufī al Kazwīnī The geographical part of the Nuzhat al-qulūb composed by [him] in 740 (1340). Vol. II. English translation with notes by GUY LE STRANGE, Leyden, BRILL, 1919. 1818

Vol. I containing the Arabic text appeared in 1915, see *Isis*, III, p. 99. G. S.

Huizinga, J. Herfsttij der Middeleeuwen. Studie over levens- en gedachtenvormen der veertiende en vijftiende eeuw in Frankrijk en de Nederlanden, XII + 568 p. Haarlem, H. D. TJEENK WILLINK en Zoon, 1919. 1818

Studies of life, thought, sensibility at the end of the Middle Ages (XIVth and XVth centuries) in France and the Low Countries. The author's aim has been to speak of this period not as the beginning of the Renaissance but as the end — the autumn — of the Middle Ages; that is, to lay stress not so much upon the novelties as upon the declining traditions of this age. G. S.

Krazer, Adolf. Zur Geschichte der graphischen Darstellung von Funktionen. *Jahresbericht der deutschen Mathematiker-Vereinigung*, t. 24, p. 340-363. Leipzig, 1915 [1916]. 1818

About 1350, ORESME has borrowed from scholastic philosophy and consciously developed the idea of representing a function graphically. — His name stands alone, for neither his contemporary SUISSET, nor (a little later) BIAGIO PELACANI have improved his original idea. The work of ORESME exerted no influence and when DESCARTES discovered analytical geometry 250 years later, he was inspired by Greek geometers, not by medieval philosophers. — See additional note by H. WIELEITNER, *Ibidem*, t. 25, p. 66, 1916. G. S.

Manning, Bernard Lord. The people's faith in the time of WYCLIF, XVI + 196 p. Cambridge University Press, 1919. 1818

Martin, Alfred von. COLUCCIO SALUTATI [1330-1406] und das humanistische Lebensideal. Ein Kapitel aus der Genesis der Renaissance, (*Beitr. zur Kulturgeschichte des Mittelalters u. d. Renaiss*, 23). IX + 299 p. Leipzig, TEUBNER, 1916. 1818

Terry, Schuyler Baldwin [1883-]. The financing of the hundred years war, 1337-1360 (*Monographs of the London school of economics*), XX + 197 p. London, CONSTABLE, 1914 1818

Würsdorfer, Joseph. Erkennen und Wissen nach GREGOR von Rimini, [d. 1358]. Ein Beitrag zur Geschichte der Erkenntnistheorie des Nominalismus (*Beitr. z. Gesch. d. Mittelalters*, XX, I), VIII + 138 p. Münster i. W., 1917. 1818

S. XV

[Carbonelli, Giovanni, 1854-]. **Bibliographia Medica Typographica Pedemontana saeculorum XV et XVI a Iohanne Carbonelli medico doctore collecta. In qua non tantum auctorum nomina sed etiam fere omnium eorum operum inscriptiones eadem forma mensuraque relatae inveniuntur. Cum appendicibus et explanationibus atque indicibus copiosissimis, [436 p. in-f°]. Romae, Excudebat Fieramosca Centenari, MCMXIV.** 1818

Admirable publication, sufficiently described by its title, containing a great many fac-simile reproductions of titlepages etc. It appeared only in 1919, the printing having been protracted since 1914. Only 200 copies have been published. G. S.

Cohn, Berthold [1870-]. **Der Almanach Perpetuum des Abraham Zacuto. Ein Beitrag zur Geschichte der Astronomie im Mittelalter. (*Schriften der wissensch. Ges. in Strassburg*, 32), 48 S. Strassburg, Trübner, 1918.** 1818

Abraham Sacut or Zacuto is one of the last medieval astronomers who wrote in Hebrew. His *Almanach Perpetuum*, Leira, Portugal 1496 (see below under Zacuto) is claimed by Bensaude to be his masterpiece. Yet Cohn believes, with Steinschneider, that Zacuto wrote only one work, his *Great Codex* (1473-1478) in Hebrew, of which 3 MSS. copies exist (Lyon, Munich, Vienna); there is also an Arabic transl. in Milano — Cohn gives extracts of the Hebrew text (Munich MS.) with translation. G. S.

Ferrand, Gabriel. A propos d'une carte javanaise du XV^e^ siècle. *Journal Asiatique*, t. XII, p. 158-169. Paris, 1918. 1818

Il s'agit de la carte mentionnée dans une lettre d'Alfonse d'Albuquerque au roi de Portugal, 1^er^ avril 1512. Le Brésil était inscrit sur cette carte javanaise. G. S.

Hartmann, J. Die astronomischen Instrumente des Kardinals Nikolaus Cusanus *Abhandl. d. Kgl. Gesel. d. Wissensch. zu Göttingen, mathem.-physik. Klasse*. Bd. X, 56 p., 12 pl. Berlin, 1919. 1818

A fundamental study of the astronomical instruments used by Cusanus and still kept in the hospital founded by him in his native city Cues on the Moselle. They are the more interesting that they are the oldest German astronomical instruments in existence. The author has made use of Cusanus' library (also kept in Cues), to understand better his instruments. An introduction contains the upshot of his investigations, then follow two chapters respectively devoted to Cusanus' *torquetum* (dating of about 1434) and to his celestial globe, both of which are very well illustrated. Wilhelm Ostwald has added an appendix dealing with a microscopic study of the painting of the globe. G. S.

Hartmann, J. Die ältesten deutschen astronomischen Instrumente. *Zeitschrift für Instrumentenkunde*, 40, p. 221-235, 7 Fig., Berlin. 1920. 1818

A further study of Cusanus' *torquetum* and astrolabe and of his wooden and copper celestial globes, with interesting information on the making of scientific instruments in Nürnberg. Important. G. S.

Panofsky, Erwin. Dürers Kunsttheorie vornehmlich in ihrem Verhältnis zur Kunsttheorie der Italiener, 210 p. Berlin, Reimer. 1915. 1818

Schuritz, Hans. Die Perspective in der Kunst Dürers. Ein Beitrag zur Geschichte der Perspective (*Diss.*, Darmstadt), 50 S., 22 T., Frankfurt, 1919. 1918

Vignaud, Henry. The Columbian tradition on the discovery of America and of the part played therein by the astronomer Toscanelli. A memoir addressed to Hermann Wagner of Göttingen and Carlo Errera of Bologna, 62 p. Oxford, Clarendon Press, 1920. 1918

There is also a French edition published by the «Société des Américanistes» of Paris (not seen). G. S.

Wieleitner, H. Zur Erfindung der verschiedenen Distanzkonstruktionen in der malerischen Perspektive. *Repertorium für Kunstwissenschaft*, XLII, p. 249-262. Berlin, 1920. 1918

« Brunelleschi hatte wahrscheinlich überhaupt keine Distanzkonstruktion irgendwelcher Art. Im Jahre 1435 oder etwas früher erfand Albert die *costruzione legittima*. Das Grund- und Aufrissverfahren wurde im Laufe des 15 Jahrhunderts in Italien ausgebildet und von Piero de' Franceschi (um 1480) gelehrt. Von der eigentlichen Distanzpunktkonstruktion finden sich nur unklare Spuren im Quattrocento. Hingegen muss diese in der französichen Gotik zur selben Zeit im Schwang gewesen sein, da sie von Viator im Jahre 1505 mit voller Sicherheit angewendet wird. In Italien lehrte sie erst, als eine fast neue Methode, Vignola, um 1530 ». G. S.

Zacuto, Abraham [born Salamanca c. 1450 — d. in Turkey, c. 1510]. Almanach Perpetuum Celestium Motuum (Radix 1473). Tabulae astronomicae Raby Abraham Zacuti, Astronomi Johannis secundi et Emanuelis serenissimorum regum Portugallae in latinum translatae per Magistrum Joseph Vizinum discipulum autoris. Reproduction fac-similé de l'exemplaire appartenant à la bibliothèque d'Augsbourg. Édition 1496, Leira. (*Histoire de la science nautique portugaise...*, documents publiés par Joaquim Bensaude, vol. 3), 335 pl. Munich, Obernetter, 1915. 1918

Sur Zacuto, voir ci-dessus Cohn, Berthold. Voir aussi *Isis*, III, p. 425. G. S.

Beltrami, Luca. La edizione nazionale vinciana e l'istituto Cermenati, 1902-1920, XI + 83 p. Milano, Allegretti, 1920. [8 Lire.] 1918

History of the efforts made in Italy since 1902 to produce a national edition of Leonardo's writings. Sharp but well deserved criticism of the Cermenati Institute and of its first publication, the *Miscellanea* published in 1919 (see *Isis*, IV, p. 48). Beltrami's paper would be more effective if it were less prolix and written in a quieter mood. G. S.

Beltrami, Luca. Leonardo, Cecilia e la « Destra Mano ». A proposito di una nota vinciana del prof. Antonio Favaro, 15 p., Milano, Allegretti, 1920. 1918

Favaro's note referred to was published in Mieli's *Archivio*, t. I, p. 403. G. S.

Bilancioni, Guglielmo. La fonetica biologica di Leonardo da Vinci. Estr. dal *Giornale di medicina militare*, fasc. XI, 26 p., 7 fig. Roma, 1919. 1918

Bilancioni, Guglielmo. La gerarchia degli organi dei sensi nel pensiero di Leonardo da Vinci. Estr. dal *Giornale di medicina militare*, fasc XI, 30 p., 3 fig. Roma, 1919. 1819

Bilancioni, Guglielmo. L'orecchio e il naso nel sistema antropometrico di Leonardo da Vinci (Studi di storia della scienza, n. 1). 105 p., 31 fig. Roma, Nardecchia, 1920. 1819

Artistic anatomy and anthropometry of nose and ear with special reference to Leonardo. Large amount of information artificially collected around a topic too small to support it. To choose a very special topic and then to speak of everything apropos of it is not a commendable method. There is a long bibliography, but open to the same criticism : it is out of focus.
G. S.

De Toni, G. B. Una ricetta medica nel Codice Atlantico [f° 270 b verso] di Leonardo da Vinci. *Giornale di medicina militare*, fasc. XI, 5 p. Roma, 1919. 1819

De Toni, Giovanni Battista. Mario Cermenati per Leonardo. Riccordi ed appunti, 53 p. Roma, Industria tipographica romana, 1920. 1819

Eulogy of Mario Cermenti with special reference to his Leonardo activities. Cermenati is the founder and head of the Istituto di studî vinciani, in Rome apropos of which, see *Isis* IV, 48. G. S.

[Leonardo da Vinci]. Per Leonardo da Vinci nel IV Centenario dalla sua morte. *Giornale di medicina militare*, anno 67, fasc. XI, p. 1189-1281. Roma, 1919. 1819

Arnaldo Angelucci. « La *maniera* in pittura e le leggi ottiche di luci e colori scoperti da L ». — Gugl. Bilancioni. « La fonetica biologica di L ». — Id. « La Gerarchia degli organi dei sensi nel pensiero di L ». — Antonino Anile. « L'anatomia di L ». — H. Hopstock. « L. e i manoscritti anatomici-fisiologici di Windsor ». G.S.

[Mieli, Aldo.] Studi e note vinciane : Reale commissione vinciana. Istituto vinciano di Roma. *Archivio di storia della scienza*, II, p. 108 -116. Roma, 1921. 1819

About the gigantic plans made by the two Italian organizations devoted to Leonardo. G. S.

S. XVI

Alexander, Philip Frederick (*editor*). The northwest and northeast passage, 1576-1611, xx + 211 p., illustr. (Cambridge travel books), Cambridge University Press, 1915. 1819

Almagià, Roberto. Il primo tentativo di misura del rapporto quantitativo fra le terre emerse e i mari. *Archivio di storia della scienza*, II, p. 51-64. Roma, 1921. 1819

The first attempt to measure the ratio of the areas of land and sea was made by the Sienese humanist Alessandro Piccolomini (1508-1578) in his Trattato della grandezza dell' acqua e della terra, 1557. This was a poor attempt, for Piccolomini concluded that taking the whole surface of the earth into account, the emerged parts were more extensive than the immerged ones, though not very much. However this was a distinct progress towards the truth if one remembers that according to the medieval notions, the emerged parts were seven times more extensive than the seas. Besides it was the first attempt to solve this problem quantitatively. G. S.

Autin, Albert. L'échec de la Réforme en France au XVI^e^ siècle, VII + 286 p, Paris, COLIN, 1918. 1918

Bay, J. Christian. CONRAD GESNER (1516-1565). The father of bibliography. An appreciation. *The Papers of the Bibliographical Society of America*, vol. 10, p. 53-88, portrait and illustr. Chicago, 1916. 1918

Bensaude, Joaquim (*editor*). Regimento do estrolabio e do quadrante. Tractade da spera do mundo. Reproduction fac similé du seul exemplaire connu appartenant à la Bibliothèque Royale de Munich. (*Histoire de la science nautique portugaise à l'époque des grandes découvertes*, vol. I), 31 p. + 64 pl. Munich, CARL KUHN, 1914. 1918

Ce *Regimento* est le plus ancien connu; il est antérieur à celui d'Evora qui lui-même fut publié avant 1521, peut-être même avant 1518. Le livre de Munich fut probablement publié après 1509, certainement après 1504. Il contient : (1) calcul des latitudes d'après la hauteur du soleil; (2) règlement de l'étoile polaire; (3) liste des latitudes des points découverts; (4) règlement pour évaluer le chemin parcouru par le navire; (5) calendrier et tables nautiques pour une année bissextile. Ce volume a paru en même temps avec une introduction en allemand dans la collection : « Seltenheiten aus Süddeutschen Bibliotheken », n° 5. G. S.

Bodin, Jean [1520-1596]. Le Colloque des secrets cachez des choses sublimes entre sept sçavants qui sont de différens sentiments. Traduction française par ROGER CHAUVIRÉ, 212 p. Paris, CHAMPION, 1914. 1918

Boehm, Erich (*editor*). WILLIAM GILBERT begründet die Lehre vom Erdmagnetismus, 1600. (*Voigtländers Quellenbücher*, 84), 69 S., 14 Abb. Leipzig, 1914 (?). 1918

Bosmans, H. La « Thiende » de SIMON STEVIN. A propos d'un exemplaire de l'édition originale qui a échappé à l'incendie de la bibliothèque de l'université de Louvain. *Revue des questions scientifiques*, 35 p. Bruxelles, 1920. 1918

Longue analyse du très rare opuscule (36 p.) publié en flamand à Leyden en 1585 : *De Thiende*. STEVIN en fit une traduction française (*La Disme*), qu'il publia la même année en annexe à son Arithmétique, chez le même éditeur CHR. PLANTYN. *La Disme* est le plus ancien manuel contenant un exposé complet et rigoureux des opérations fondamentales relatives aux fractions décimales; STEVIN y défend l'emploi systématique non seulement des fractions décimales, mais aussi d'une métrologie décimale. G. S.

Bosmans, H. Quel fut l'auteur du « De quadrante geometrico libellus » édité à Nuremberg en 1594 aux frais de CORNEILLE DE JODE? *Revue des questions scientifiques*, 13 p. Bruxelles, 1920. 1918

L'auteur du texte de cet admirable livre d'images est le Gantois LIÉVIN HULSIUS qui mourut à Francfort en 1606. C'était un libraire-éditeur doublé d'un marchand d'appareils scientifiques et son *De quadrante geometrico* était peut-être écrit en partie pour allécher le lecteur et le déterminer à acheter l'instrument en question. Aux cinq exemplaires de cet opuscule rarissime mentionnés par le R. P. BOSMANS, il faut en ajouter au moins un 6^e^, celui de l'Université HARVARD. G. S.

Bosmans, H. L'œuvre scientifique de MATHIEU RICCI, S. I. [Macerata, 6 oct. 1552 — Péking, 11 mai 1610]. *Revue des questions scientifiques*, 16 p., janvier 1921. 1818

Une étude des travaux de géographie et de mathématique du plus grand missionnaire que la Compagnie de Jésus ait envoyé en Chine, à propos de la publication de ses Mémoires et de sa Correspondance, par les soins du P. TACCHI VENTURI, 2 vol., gr. in 4°. Macerata 1911-1913. G.S.

Butler, Sir Geoffrey [1887-]. Studies in Statecraft. Being chapters biographical and bibliographical mainly on the sixteenth century, VII + 138 p. Cambridge University Press, 1920. 1818

Callender, Geoffrey. Was DRAKE guilty of murder? *Discovery*, t. I, p. 293-300. London, 1920. 1818

The author's conclusion is thate DRAKE should be absolved. Bibliography (see below NUTTALL). G. S.

Charbonnel, J. R. La pensée italienne au XVI^e^ siècle et le courant libertin, IX + 720 + LXXXIV p. Paris, CHAMPION, 1919. 1818

Chauviré, Roger. JEAN BODIN, auteur de la République, 543 p. Paris, CHAMPION, 1914, 1818

Choate, Helen A. The earliest glossary of botanical terms; FUCHS 1542, *Torreya*, vol. 17, p. 186-201, 1917. 1818

Miss CHOATE has compared this glossary with a modern one (JACKSON, 1900). Of the 127 terms (exclusive of synonyms) used by FUCHS, 83 or 66 per cent., are still in use with identical or closely related meaning, 22 are in use but with changed meaning, 14 are obsolete, 7 are not botanical terms. The author examines each term separately. G. S.

Crane, Thomas Frederick [1844-]. Italian social customs of the XVIth century. Their influence on the literature of Europe, XV + 690 p. New Haven, YALE University Press, 1920. 1818

De Toni, Ettore Appunti botanici del codice-erbario di PIETRO ANTONIO MICHIEL [Venezia 1510-ibid. 1576]. *Archivio di storia della scienza*. t. I, p. 137-140. Roma, 1920. 1818

Dreyer, J. L. E. On TYCHO BRAHE's Manual of Trigonometry. *The Observatory*, vol. 39, p. 127-131, 1916. 1818

Shows that the method of *Prosthaphaeresis* was due to PAUL WITTICH and MELCHIOR JOBSTEL. J. L. E. D.

Dreyer, J. L. E. On TYCHO BRAHE's catalogue of stars. *The Observatory*, vol. 40, 229-233, 1917. 1818

How the star-places were found and catalogued. J. L. E. D

Dreyer, J. L. E. The alleged new star of the year 1578. *The Observatory*, vol. 42, p. 161-162, 1919. 1818

There was no temporary star in that year, nor any comet after the Great Comet of Nov. 1577 to Jan. 1578. J. L. E. D.

Dyroff, Adolph [1866-]. Ueber FR. BACONS Vorläufer. (MOCENIGO). *Renaissance und Philosophie*, 13. H., p. 107-109. Bonn, 1916. 1818

The archbishop Filippo Mocenigo of Nicosia, Cyprus, gave in 1581 (?) a theory of induction which is more elaborate than that of Aristotle and of the schoolmen, and has already a modern accent. This short note is published as appendix to Matth. Uedelhofen. Die Logik Petrus Fonsecas [Pedro da Fonseca, 1528 Cortizada, Portugal — 1599 Lisbon]. G.S.

Faleiro, Francisco. Tratado del esphera y del arte del marear. Reproduction fac-similé de l'exemplaire appartenant à la bibliothèque royale de Munich. Edition 1535, Séville. 102 pl (*Histoire de la science nautique portugaise à l'époque des grandes découvertes.* Collection de documents publiés par Joaquim Bensaude, vol. 4). Munich, Obernetter, 1915. 1818

Cet ouvrage qui était terminé en 1532 (date de l'approbation royale espagnole) est le premier traité de navigation imprimé dans la péninsule, si l'on ne compte pas comme tels les Règlements de l'astrolabe. Il contient plusieurs méthodes pour mesurer la déviation magnétique et marque un très grand progrès sur les Règlements (voir plus haut, Bensaude). Francisco était le frère de Ruy Faleiro collaborateur de Magalhães; c'était un Portugais au service de l'Espagne. G. S.

Heckmanns, Joseph. Die Aeusserungen des Desiderius Erasmus von Rotterdam zur Tierpsychologie. *Renaissance und Philosophie*, 13. H., p. 113-206. Bonn, 1916. 1818

Hellmann, G. Die älteste gedruckte Nordlichtbeschreibung. *Beitr. zur Gesch. d. Meteorologie*, Nr. 3, p. 107-113. Berlin, 1914. 1818

The first *printed* descriptions of *aurora borealis* occur in 1527. Hellmann gives an account of various publications (three title-pages are reproduced) describing the *aurora* of Oct. 11, 1527, but under the name of comet. The earliest good description of a northern light is found in a Norse MS. of the xiiith century, and it is called northern light (nordurljós). This name however, does not seem to have been printed before 1716. G S.

Lucas, Frederic A. The unicorn and his horn. *Natural History*, vol. XX, p. 532-535. New York, 1920. 1818

Contains, mixed with older material, an illustrated description of the horn of Indian Rhinoceros known as alicorne or unicorn which was presented to Pope Gregory xiv, in 1590, because of its reputed medicinal qualities. The tip of this historical horn is missing, for it was reduced to powder and administered to the Pope in his last illness. This horn was purchased by Dr L. Pollak of Rome at the Ferroni sale of 1909, from whom it was obtained by Mr. John Marshall who presented it to the American Museum of Natural History of New York in 1920. G. S.

Mestwerdt, Paul [1888-1914]. Die Anfänge des Erasmus. Humanismus und « Devotio moderna ». Mit einer Lebenskizze von C. H. Becker, hrg. v. Hans von Schubert (*Studien zur Kultur und Gesch. d. Reformation*, 2), xxi + 343 p., Bildniss. Leipzig, Haupt, 1917. 1818

Murray, Robert Henry [1874-]. Erasmus and Luther. Their attitude to toleration, xxiii + 503 p., London. Society for promoting Christian Knowledge, 1920. 1818

Nunez, Pedro [or Nonius, b. Alcaçar do Sal 1492 — d. 1577 or 1578]. Tratado da sphera com a theorica do sol e da lua e ho primeiro livro da geographia de Claudio Ptolomeo. Tirados novamente de latim em lingoagem pello doutor Pero Nunez. Tratado que ho

doutor PERO NUNEZ fez em defensam da carta de marear. Tratado que ho doutor PERO NUNEZ fez sobre certas duvidas da navegaçâo. Reproduction fac-similé de l'exemplaire appartenant à la bibliothèque du duc de Brunswick à Wolfenbüttel. Édition 1537, Lisbonne (*Histoire de la science nautique portugaise*, ..., documents publiés par J. BENSAUDE, 5), 180 p. in-fol., Munich, OBENRETTER, 1915. 1818

Cet ouvrage est très important parce que NUNEZ y insiste sur l'urgente nécessité de donner des bases rigoureuses à la cartographie, et de faire des observations scientifiques sur la déviation magnétique. Il n'y parle pas du calcul des longitudes. Cette œuvre prépare celle de MERCATOR. — Cette reproduction fac-similé, comme les autres parues dans la même collection (voir S. XV, ZACUTO; S. XVI, BENSAUDE; FALEIRO) est splendide : elle fait honneur à la république portugaise. G. S.

Nuttall, Zella. New light on DRAKE. A collection of documents relating to his voyage of circumnavigation, 1577-1580 Translated and edited, LVI + 443 p., 17 plates and maps. London, HAKLUYT Society (2nd series, no. 34), 1914. 1818

A collection of 65 hitherto unpublished Spanish documents, discovered by the author in the archives of Mexico, Spain and other countries; edited, translated and fully annotated with reference to many other MSS. This volume completes DRAKE's *World Encompassed* edited by W. S. W. VAUX, HAKLUYT Society, 1854. It is a very important contribution to our knowledge of Sir Francis DRAKE. G. S.

Ortroy, Fernand van. L'œuvre cartographique de GÉRARD et de CORNEILLE DE JODE, XXXV + 130 p., 5 pl., 1 portrait (de GÉRARD). Gand, VAN GOETHEM, 1914. 1818

GÉRARD DE JODE, naquit à Nimègue en 1509, mourut à Anvers le 5 février 1591; CORNEILLE, son fils, mourut en 1600 dans sa 32e année. Ils n'étaient pas juifs quoiqu'ils fussent appelés DE JODE = DE IVDAEIS. G.S.

Peters, Hermann. LUTHERS Stellung zur Chemie. *Chemiker Z.* S. 729, 1917. 1818

Sadoleto, Iacopo. [Modena 1477 — Roma 1547]. On Education. A translation of the « de pueris recte instituendis » with notes and introduction by ERNEST TRAFFORD CAMPAGNAC and K. FORBES, XLVIII + 141 p. London, MILFORD, 1916. 1818

Schuller, Rudolf. The ORDÁZ and DORTAL expeditions in search of El-Dorado as described on sixteenth century maps. Smithsonian miscellaneous collections, vol. 66, no. 4. Washington, 1916. 1818

Reproduces and discusses OVIEDO's Huyapari map which the author believes was only drawn after 1542 (and not in 1532 as HARRISSE said) and the Spanish anonymous map of about 1560. G. S.

Smith, David Eugene. The first work on mathematics printed in the new world. *The American mathemathical monthly*, t. XXVIII, p. 10-14, 1921. 1818

This is the *Sumario Compendioso* published in Mexico City 1556. A facsimile reprint of the original work will presently be published by GINN, Boston, with translation and notes by Prof. SMITH. G. S.

Smith, Vincent Arthur. AKBAR, the great Mogol, 1542-1605 Oxford, CLARENDON Press, 1917. Second ed. revised, XVI + 504 p., 1919, (or 1920?, not seen). 1818

Stillman, John Maxson. THEOPHRASTUS BOMBASTUS VON HOHENHEIM called PARACELSUS His personality and influence as physician, chemist and reformer, VIII + 184 p. Chicago, Open Court, 1920. 1818

A new general study based upon recent research (SUDHOFF etc.) and for the text upon the Strassburg folio ed. of 1616, the Chirurgische Bücher und Schriften, ibid. 1618 and the extracts from Paracelsus MSS. contained in SUDHOFF's fundamental bibliography, 1894-1899. G. S.

Sudhoff, Karl. ANDREAS VESALIUS zu Ehren, zum vierhundertjährigen Gedächtnis seiner Geburt gesprochen. 29 S., 18 Fig. [1914? 1915? sine loco et anno]. 1818

Vignaud, Henry. AMÉRIC VESPUCE, 1451-1512. Sa bibliographie, sa vie, ses voyages, ses découvertes, l'attribution de son nom à l'Amérique, ses relations authentiques et contestées, IX + 421 p. (*Recueil de voyages et de documents pour servir à l'histoire de la géographie depuis le XIII^e^ jusqu'à la fin du XVI^e^ siècle*, 23). Paris, LEROUX, 1917. 1818

S. XVII

Bacchini, Amato. La vita e le opere di GIOV. MARIA LANCISI [Roma 1654-1720] 115 p., ritr., 7 tav., 10 ill. Roma, SANSAINI, 1920. 1818

Bosmans, H. La notice nécrologique de FERDINAND VERBIEST par son secrétaire ANTOINE THOMAS de Namur, vice-président effectif et président intérimaire de l'Observatoire de Péking. *Annales de la Société d'Emulation*, p. 102-133. Bruges, 1914. 1818

A reprint of Father VERBIEST's *Elogium*, that is, the circular letter announcing his death and describing his life, which was sent according to custom, to his Jesuit brothers. This *Elogium* was printed in 1688, soon after VERBIEST's funerals; it is likely that only very few copies, say 20, were printed, but translations in Spanish and German were published in 1691 and 1728. Father BOSMANS' paper contains an introduction (14 p.) then the text : Elogium Reverendi Patris FERDINANDI VERBIEST. A plate reproduces VERBIEST's epitaph in Latin and Chinese. Many footnotes elucidate the text. G. S.

Bosmans, H. A propos d'un exemplaire de la première édition de la RABDOLOGIE de NEPER qui a échappé à l'incendie de la bibliothèque de l'université de Louvain. *Annales de la Société scientifique de Bruxelles*, session du 27 novembre 1919, 1^re^ section. 1818

Complete description of the first edition of the *Rabdologiae seu numerationis per virgulas libri duo. Edinburgi* 1617, 154 p., 4 pl. in-12. The second and third editions appeared in Leyden 1626, 1628 and ADR. METIUS published a summary of it in his *Manuale arithmeticae et geometricae practicae*, Amsterdam 1634. G. S.

Bulpit, W. T. Misconceptions concerning JEREMIAH HORROCKS, the astronomer. *The Observatory*, vol. 37, p. 335 337, 1 pl., 1914. 1818

He was not ordained; he died at the age of 21, moreover there is no record of his ordination. J. L. E. D.

Campanella, Tommaso [b. in Calabria 1568-d. Paris 1639]. La Città del Sole. Testo critico, introduzione e note a cura di GIUSEPPE PALADINO, XXXI + 164 p. Napoli, GIANNINI, 1920. 1818

Cardini, Massimiliano, FRANCESCO REDI (Vite dei medici e naturalisti celebri, 2) 118 p., 8 pl. Firenze, 1914. 1818

Dietz, Johann [-Halle 1738] Meister JOHANN DIETZ des Grossen Kurfürsten Feldscher und Königlicher Hofbarbier. Nach der alten Handschrift in der Kgl. Bibl. zu Berlin zum ersten Male in Druck gegeben von Dr. ERNST CONSENTIUS (Schicksal und Abenteuer. Lebensdokumente vergangener Jahrhunderte. XI. Bd.), 368 S. LANGEWIESCHE-BRANDT. Ebenhausen bei München, 1915. 1818

Autobiography of a barber, that is a surgeon, at the end of the seventeenth century and the beginning of the eighteenth. The title quoted on p. 11, being more explicit than that of the book, is worth quoting : « Meister Johann Dietz. Das ist die getreue von ihm selbst gemachte Beschreibung seines Lebens, *item* alles dessen was er wider die Türken, am Nordpol, in deutschen Gauen und Gassen, unter Soldaten, Räubern und Bürgern, Jungfern und Gespenstern, endlich in seiner Vaterstadt Halle mit zweien Frauen erfahren und so aus dieser Welt insgesamt hat leiden müssen ». This book has obtained a very great success, as 35 thousand copies had already been printed in 1919. The editor has added an introduction, notes (p. 321-330), archival documents concerning the author, his family and the barber profession, and an index. G. S.

Doublet, E. Le tricentenaire de l'abbé PICARD. *Revue générale des sciences*, t. 31, p. 561-564. Paris, 1921.

JEAN PICARD né à La Flèche le 21 juillet 1620, mort vers 1683 (1682? 1684?), astronome, physicien. Courte biographie. G. S.

Doumic, René. Les fêtes de DESCARTES à Amsterdam. *Revue des Deux Mondes*, p. 151-156. Paris, nov. 1920. 1818

Favaro, Antonio. Quarant'anni di studi Galileiani (1876-1915). *Atti d. R. Istituto Veneto*, t. 74, p. 2da, 1615-1658. Venezia, 1916. 1818

A bibliographical list of the Galilean writings of the indefatigable great old man, with a very useful subject index. The list contains 215 items, and it must be noted : (1) that it is not complete for FAVARO is still very active and has published many other Galilean papers since 1915; (2) that the twenty large volumes of the monumental edition of GALILEO's works (1890-1909) are but one item of the list (n° 61); (3) that FAVARO has written a very large number of papers on other subjects. G. S.

Favaro, Antonio, EVANGELISTA TORRICELLI e GIOVANNI CIAMPOLI. *Archivio di storia della scienza*, II, p. 46-50. Roma, 1921. 1818

Apropos of C. DE WAARD's contention (Un episodio della vita di T. sconosciuto ai suoi biografi, LORIA's *Bollet.*, II, 33-35, 1919) that T. acted as secretary to Mons^r GIOVANNI CIAMPOLI, while the latter was governor of Fabriano. FAVARO considers that this contention is non proven. G. S.

Favaro, Antonio. La casa di Arcetri nella quale spirò Galileo « Monumento Nazionale ». *Archivio di Storia della Scienza*, I, p. 438-440. Roma, 1920. 1818

The house called « Gioielli » in Arcetri, a suburb of Florence, wherein Galileo died at 4 A. M. on the 8th of January 1642, is now a national monument. Prof. Antonio Abetti of the Astronomical observatory of Arcetri has been collecting for a long time Galileo materials of all kinds. New physical institutes will soon be established in Arcetri which will become the scientific center of Florence and at the same the main center of information on Galileo. G. S.

Hakovb Karnétsi. [Jacob d'Erzeroum]. Erzeroum ou la Topographie de la Haute Arménie. Texte arménien de Havkob Karnétsi (XVII^e^ siècle) publié par K. Kostaneants (1903), traduit et annoté par Frédéric Macler (1917). *Journal Asiatique*, t. XIII, p. 153-237. Paris, 1919. 1818

Hellmann, G. Die Vorläufer der Societas Meteorologica Palatina. *Beitr. zur Geschichte der Meteorologie*, Nr. 5, p. 139-147. Berlin, 1914. 1818

Apropos of the endeavours to organize comparative meteorological observations in various places before the first successful and relatively large undertaking of this kind by the Societas Meteorologica Palatina of Mannheim in 1780. The earliest mentioned is that by the Landgrave Hermann of Hessen (Uranophilus Cyriandrus) 1637; then, the earliest observations *with* instruments in Paris, Clermont-Ferrand and Stockholm 1649-1651; then the comparative observations organized since 1654, by the Grandduke of Toscana, Ferdinand II and his brother Leopold, the founder of the Accademia del Cimento, etc. G.S.

Hellmann, G. Die ältesten instrumentellen meteorologischen Beobachtungen in Deutschland. *Beitr. zur Gesch. d. Meteorologie*, Nr. 2, S 103-107; *Veröff. d. Kgl. Preuss. meteor. Inst.*, Nr. 273. Berlin, Behrend, 1914. 1818

The oldest meteorological observations in Germany with the help of instruments were inspired by Leibniz and took place in Hannover 1678 and Kiel 1679. Hellmann publishes the facts concerning both cases. G.S.

Hellmann, G. Die erste meteorologische Instrumentenkunde. *Beitr. zur Geschichte der Meteorologie*, t. II, S. 334-339. Berlin, 1917. 1818

The first writing giving information on the meteorological instruments (thermo-, baro- and hygrometer) was due to Samuel Reyher, *de aere*, Kiel 1669. A larger work in 2 vol. was published in Nurnberg 1676-84, J. C. Sturm's *Collegium Experimentale*. But the most successful book of this kind was Dalencé's *Traittes des baromètres, thermomètres et notiomètres ou hygromètres*. Amsterdam 1688. Hellman describes 12 editions of this book published in 4 languages from 1688 to 1753. G.S.

Huygens, Christian. [La Haye 1629-La Haye 1695]. Traité de la Lumière. (Les maitres de la pensée scientifique). x + 155 p. Paris, Gauthier-Villars, 1920. [3 fr. 60] 1818

Reproduction of the original text of this great treatise published in Leyden 1690, but of which Huygens had written the largest part as early as 1678 while he was dwelling in France. See the account of it which I gave (*Isis*, I, p. 273-274) apropos of Silvanus Thompson's English translation, London 1912. G. S.

Huygens, Christiaan. Œuvres complètes publiées par la Société hollandaise des Sciences. La Haye, Nijhoff. t. I-XII, 1888-1910; t. XIII. Dioptrique, 1653-1692, 1916; t. XIV. Calcul des probabilités. Travaux de mathématiques pures, 1655-1666, 1920. 1818

Knobel, E. B. On FREDERICK DE HOUTMAN'S Catalogue of Southern Stars and the origin of southern constellations. *Monthly notices of the R. astronomical society*, vol. 77, p. 414-432, 580, 1917. 1818

The catalogue published by HOUTMAN in 1603 and reproduced here and the formation of the 12 southern constellations are really due to PIETER DIRCKSZ KEYZER. J. L. E. D.

Loria, Gino. NEWTON. (*Profili*, N. 52). 69 p., 1 portrait. Roma, FORMIGGINI. 1920. [L. 3] 1818

A well-informed and pleasantly written sketch followedby a good bibliography. G. S.

Marius, Simon. The Mundus Jovialis, translated by A. O. PRICKARD from the original, Nürnberg 1614. *The Observatory*, vol. 39, p. 367-380, 403-412 (with plate), p. 443-451, 498-503, 1916. 1818

See also *Ibidem*, vol. 40, p. 119-122, 1917 a note by the translator on the question of priority as to the discovery of the four satellites of Jupiter. J. L. E. D.

Mautz, Otto. Zur Basisbestimmung der Napierschen und Bürgischen Logarithmen. Beilage zu den Jahresber. des Gymnasiums, der Realschule u. der Töchterschule in Basel, 50 p., 1 pl. Basel, 1919. 1818

A very elaborate examination of the whole subject followed by criticisms of the treatment of same question by various authors (CANTOR, WEBER-WELLSTEIN, TROPFKE, FÄRBER, WITTSTEIN, KOPPE, BRAUNMÜHL, ROUSE BALL; BALL'S account is particularly bad). G.S.

Mautz, Otto. Zur Stellung des Dezimalkommas in der Bürgischen Logarithmentafel. *Verhandl. der naturfors. Gesellschaft in Basel*, Bd. 32, p. 104-106, 1921. 1818

An addition to MAUTZ'S paper of 1919 : « Die Byrgii Arithmetica » und der « gründliche Unterricht » lassen fast mit Sicherheit den Schluss aus, das das Bürgische Ringlein [*i.e.* a little circle placed above the numeral] die Rolle unseres Dezimalkommas spielt. Als Basis der Bürgischen Logarithmensystems muss somit $\sqrt[10]{1{,}0001}$ angesehen werden... » G.S.

Meier, Matthias. DESCARTES und die Renaissance, XII + 68 p. Münster i. W., ASCHENDORFF, 1914. 1818

Morse, Katherine. MILTON'S ideas of science as shown in « Paradise lost ». *Scientific Monthly*, v. 10, p. 150-156. New York, 1920. 1818

Mundy, Peter [b. Penryn in Cornwall, c. 1596-d. after 1667]. The Travels of PETER MUNDY in Europe and in Asia, 1608-1667. Edited by Lt. Col. Sir RICHARD CARNAC TEMPLE, Bart. 4 vol. London, HAKLUYT Society, 1907-1919. 1818

Vol. I. Cambridge 1907 : Travels in Europe, 1608-1628, with an introduction of 51 p. Vol. II, 1914. Travels in Asia 1628-1634. Vol. III, part I, 1919. Travels in England, Western India, Achin, Macao and the Canton river, 1634-1637. Vol. III, part II, 1919. Travels in Achin, Mauritius, Madagascar and St Helena 1638.

Sorley, William Ritchie. [1855-]. SPINOZA. (Third annual lecture on a master mind) 20 p. For the British Academy. London, MILFORD, 1918. 1818

Turnbull, G. H. SAMUEL HARTLIB. A sketch of his life and relations to J. A. COMENIUS. VIII + 79 p. London, MILFORD, 1920. 1818

Vaughan, Thomas [1622-1666]. The works of THOMAS VAUGHAN. Edited, annotated and introduced by ARTHUR EDWARD WAITE. LI + 498 p. London, Theosophical publishing house, 1919. 1818

An English poet and alchemist, whose alchemical writings were published under the pseudonym : EUGENIUS PHILALETHES. G. S.

Wieleitner, H. Zur Erfindung der analytischen Geometrie. Mathematisches Lesebuch hrg. v. W. DIECK, 13 p. Sterkrade, 1921. 1818

Reprinted in slightly abbreviated form from *Z. f. math. u. naturw. Unterricht*, vol. 47, p. 414-426, 1916. Explains first DESCARTES' contribution, then that of FERMAT. G. S.

S. XVIII

Archibald, R. C. Time as a fourth dimension. *Bull. American mathematical soc.*, vol. 20, p. 409-412, 1914. 1818

Was LAGRANGE the first to conceive time as a fourth dimension of space? In his *Théorie des fonctions analytiques* indeed he states that mechanics can be considered as a geometry of four dimensions, but does not elaborate this idea any further. D'ALEMBERT in the article « Dimension » published in his Encyclopédie 1754, says : « Un homme d'esprit de ma connaissance [LAGRANGE, then Ae. 18!] croit qu'on pourrait regarder la durée comme une quatrième dimension ... ». G. S.

Berkeley, George. [Dysert, Kilkenny county, Ireland 1685—Oxford 1753]. La Siris, publiée pour la première fois en 1744. Traduction française par GEORGES BEAULAVON et DOMINIQUE PARODI (Les Classiques de la Philosophie), VIII + 160 p. Paris, COLIN, 1920. [5 fr.] 1818

French translation with biographical, bibliographical and critical notes of BERKELEY's treatise : *Siris*, a chain of philosophical reflexions and inquiries concerning the virtues of tar-water..., 1744, — which is generally known in French and other languages as « Tar-Water » (*L'eau de goudron*). Berkeley had brought back from Rhode Island where he lived from 1728 to 1732, a knowledge of the medical use of tar water and his *Siris* is an extraordinary philosophico-medical miscellany devoted to the propagation at one and the same time of his philosophical ideas and of this wonderful panacea. The translation has evidently been made with great care. G.S.

Berkeley, George. Les Principes de la connaissance humaine. Traduction de CHARLES RENOUVIER. (Les Classiques de la Philosophie, VIII). XII + 110 p. Paris, COLIN, 1920. [4 fr.] 1818

Reprint of RENOUVIER's translation of BERKELEY's treatise concerning the principles of human knowledge, 1710, which first appeared in the *Critique Philosophique*, fifth year, 1889. The new editor A. LALANDE has made a few minor alterations to increase the accuracy of the translation. G. S.

Brown, P. Hume [1845-1918] The Life of GOETHE. With a prefatory note by Viscount HALDANE, 2 vol., illustr. London, MURRAY, 1920. 1918

Cajori, Florian. A history of the conceptions of limits and fluxions in Great Britain from NEWTON to WOODHOUSE, VIII + 300 p. Chicago, Open Court, 1919. 1919

Choate, Helen A. An unpublished letter by GRONOVIUS. *Torreya*, vol. 16, p. 116-119, 1916. 1918

A letter from JOHN. FRIED. GRONOVIUS to JOHN BARTRAM dated Leyden, June 26, 1751; now kept in the botanical library of Smith College, Northampton, Mass. G. S.

Dreyer, J. L. E. Descriptive catalogue of a collection of WILLIAM HERSCHEL papers presented to the R. astronomical society by the late Sir W. J. HERSCHEL. *Monthly notices of the R astronomical soc.*, vol. 78, p. 547-554, 1918. 1918

Fletcher, C. R. L. and **Walker, Emery**. Historical Portraits, 1700-1850. Introduction by C. F. BELL, 2 vol. Oxford, CLARENDON Press, 1919. 1919

Deals only with British portraits, each being reproduced by EMERY WALKER, the lives briefly told by FLETCHER. This collection includes the portraits of many scientists. G. S.

Fox, R. Hingston. Dr JOHN FOTHERGILL and his friends. Chapters in eighteenth century life. XXIV + 434 p. London, MACMILLAN, 1919. 1919

Freshfield, Douglas W. The life of HORACE BÉNÉDICT DE SAUSSURE [Geneva 1740-1799]. With the collaboration of HENRY F. MONTAGNIER, XII + 479 p. London, E. ARNOLD, 1920. 1919

Hellmann, G. Die ältesten meteorologischen Symbole. *Beitr. zur Gesch. d. Meteorol.*, t. II, p. 317-324. Berlin, 1917. 1918

Neglecting the mere abbreviations and the symbols used in calendars printed for illiterate peasants, the first symbols used with a scientific purpose and printed are found in P. VAN MUSSENBROECK. *Physicae experimentales et geometricae...*, Leyde 1729, — and a little later in an anonymous book by a meteorologist of Thuringia, Eisenberg, 1733. Then followed LAMBERT, 1758, 1771, VON FELBIGER 1773, the Norwegian pastor J. N. WILSE 1778, J. L. BÖCKMANN 1780, and the much improved system devised for the Societas Meteorologica Palatina by HEMMER, first published 1783, etc. G. S.

Jovy, Ernest. Quelques lettres de M. EMERY au physicien GEORGES LOUIS LE SAGE, conservées à la Bibliothèque de Genève, 61 p. Paris, Société française d'imprimerie et de librairie, 1916. 1918

Lettres de l'abbé EMERY (m. 1811), théologien et supérieur de Saint-Sulpice pendant la révolution, à LESAGE, 1796 à 1800. L'abbé EMERY y parle

surtout de science et de philosophie; il y fait allusion à de MONTMOR, THOMAS BURNET, EULER, NEWTON, etc. G. S.

Kaye, G. R. A guide to the old observatories at Delhi, Jaipur, Ujjain, Benares. VII + 108 p., 15 pl. Calcutta, Government printing office, 1920. 1818

An abstract of the larger volume fully analyzed in *Isis* II, 421-423. G.S.

Kleinelbst, Richard. G. CHR. LICHTENBERGS Stellung zur deutschen Literatur, VI + 60 p. Strassburg, TRÜBNER, 1915. 1818

Lancisi, Giovanni Maria [1654-1720]. Per GIOVANNI MARIA LANCISI nel II centenario dalla sua morte. *Giornale di medicina militare*, anno 68, fasc. IX, p. 541-642, illustr. Roma. Sett. 1920. 1818

Contains discourses pronounced by ETTORE MARCHIAFAVA in Roma and MODESTINO DEL GAIZO in Naples, also the following : SILVESTRO BAGLIONI. Il metodo dello studio della medic. secondo LANCISI; GUGL. BILANCIONI. LANCISI e lo studio degli organi di senso; PIETRO CAPPARONI. Lancisiana (Documenti inediti : Atti di nascita e di morte, etc). G. S.

Lavoisier, Antoine-Laurent [Paris 1743-Paris 1793]. Mémoires sur la respiration et la transpiration des animaux (Les maitres de la pensée scientifique), VIII + 67 p. Paris, GAUTHIER-VILLARS, 1920. [3 fr.] 1818

Réimpression de quatre mémoires fondamentaux de LAVOISIER datés respectivement de 1777, 1785, 1789 et 1790, les deux derniers signés « SEGUIN et LAVOISIER ». G. S.

Loria, Gino. Per la storia del newtonianismo in Italia. *Atti della Soc. italiana del Progresso delle Scienze*, X Riunione, 7 p. Pisa, 1919. Roma, 1920. 1818

Reproduces two anonymous Italian poems dealing with Newtonian philosophy and alludes to a third one; all three of the XVIIIth century. This is of interest to the historian of thought rather than to the historian of science. G. S.

Macpherson, Hector. HERSCHEL. 78 p. London, Society for promoting Christian Knowledge, 1919. 1818

Marguet, F. Histoire de la longitude en mer au XVIII^e^ siècle en France X + 227 p. Paris, CHALLAMEL, 1917. 1818

Mourelle, Don Francisco Antonio [or MAURELLE]; born in San Adrián de Corme, Coruña, 1755; d Cádiz, 1820]. Voyage of the Sonora in the second Bucareli expedition to explore the north-west coast, survey the port of San Francisco and found Franciscan missions and a presidio and pueblo at that port. His journal kept in 1775 on the Sonora, translated by the Hon. DAINES BARRINGTON [1727-1800] ... with notes by THOMAS C. RUSSELL, a portrait of BARRINGTON and the DE LA BODEGA Carta General, 1791, XII + 120 p. in-4° [only 230 copies]. San Francisco, Calif. THOMAS C. RUSSELL, 1734 Nineteenth Avenue, 1920. 1879

[Priestley, Joseph] The Northumberland home of JOSEPH PRIESTLEY, *Scientific monthly*, v. X, p. 522-524. New York, 1920. 1818

See *Isis*, III, 342. The present note contains additional information, two views of the house and a portrait of PRIESTLEY. G. S.

Ramsay, Sir **William**. The life and letters of JOSEPH BLACK, M. D. With an introduction dealing with the life and work of Sir WILLIAM RAMSAY by F. G. DONNAN, XIX + 148 p. London, CONSTABLE, 1918. 1918

Saccheri, **Giovanni Girolamo** [San Remo, Sept. 1667-Milano 1733]. EUCLIDES Vindicatus [Milano 1733]. Edited and translated by GEORGE BRUCE HALSTED, XXX + 246 p. Chicago, Open Court, 1920. 1918

Slosson, **Edwin E.** JONATHAN EDWARDS as a Freudian. *Science*, vol. 52, p. 609, Dec. 24, 1920. 1918

Apropos of a note of the American philosopher and theologian, JONATHAN EDWARDS' [1703-1758] diary dated 1722, May 2. G. S.

Spallanzani, **Lazare** [Scandiano 1729 — Pavia 1799]. Observations et expériences faites sur les animalcules des infusions. (Les maîtres de la pensée scientifique), 2 vol., VIII + 106 + 122 p. Paris, GAUTHIER-VILLARS, 1920. [6 fr.] 1918

Reproduction de la traduction de JEAN SENEBIER, Genève 1786 (1re éd. 1777). Pour juger de l'importance de cette publication, je prie le lecteur de se reporter à l'article consacré à cette œuvre fondamentale de SPALLANZANI par le regretté A. GEORGES-BERTHIER dans *Isis*, II, 209-213. Nous souhaitons le plus grand succès à cette nouvelle collection des classiques de la science! G. S.

Thomson, Sir **St. Clair**. JOHN COAKLEY LETTSOM and the foundation of the Medical Society. (Presidential address, oct. 8, 1917). London, HODSON, 1919. 1918

LETTSON, b. in West Indies 1744 — d. 1815, was the founder of the oldest medical society. G. S.

Thorpe, **T. E.** JOSEPH BLACK and Belfast. *Nature*, vol. 106, p. 165. London, 1920. 1918

Apropos of HENRY RIDDELL'S memoir on J. BLACK and his Belfast friends and family connections, published in the *Proc. of the Belfast Natural History and Philos. Soc.*, III, p. 49, 1919 (not seen). G. S.

S. XIX

A. — *Mathematics*

Archibald, **R. C.** Geometrography and other methods of measurement of geometrical constructions. *The American mathematical monthly*, t. 25, p. 37-38, 1918. 1918

Short bibliographical note on geometrography, that is, the art of geometrical constructions, invented by EMILE LEMOINE (1840-1912). His first memoir on this subject appeared in 1888 and he summed up his theory in his *Géométrographie*. Paris 1902. G. S.

Archibald, **R. C.** GAUSS and the regular polygon of seventeen sides. *American mathematical monthly*, vol. 27, p. 323-326, 1920. 1918

Cajori, Florian. Augustus De Morgan on divergent series. *Bull Amer. Math. Soc.*, vol. 27, p. 77-81, 1920. 1818

Cajori shows that De Morgan deserves to be ranked as a pioneer in the development of the modern theories of divergent series. G. S.

Cremona, Luigi. Opere matematiche pubblicate sotto gli auspici della R. Accademia d. Lincei, t. I-III. Milano, Hoepli, 1914, 1915, 1917. 1818

The third volume contains a biography by E. Bertini. G. S.

Plummer, H. C. The present position of celestial mechanics. *Scientia*, xxix, 1-12, 1er janv. 1921. Traduct. française : supplément 1-11. 1818

Revue des grandes étapes parcourues par la mécanique céleste depuis le milieu du xixe siècle. L. G.

Gauss, Carl Friedrich [1772-1855]. Werke. Hrg. v. d. kgl. Gesellschaft der Wissenschaften zu Göttingen. 10. Bd, 1te Abteilung, 586 p. 4°. Leipzig, Teuner, 1917. 1818

Contains Nachträge zur reinen Mathematik. — This publication of Gauss' Works began in 1866. G. S.

Hermite, Charles [1822-1901]. Œuvres publiées sous les auspices de l'Académie des sciences, par Emile Picard, t. IV [et dernier], vi + 594 p. Paris, Gauthier-Villars, 1917. 1818

Ce dernier volume contient les travaux de 1880 à 1901, et les portraits d'Hermite parus dans les vol. I-III, y sont complétés par une reproduction de la médaille due à Chaplain. Plusieurs notices biographiques (discours académiques, etc.) sont mêlées aux mémoires mathématiques. Le tome I parut en 1905. G. S.

Klein, F.: Brendel, M. und Schlesinger, L. (*editors*) Materialien für eine wissenschaftliche Biographie von Gauss. Heft I-VII. Leipzig, Teubner, 1911-1919. 1818

I. 1911. P. Bachmann. Ueber Gauss' zahlentheoretische Arbeiten, 54 S. — II. 1912. C. F. Gauss. Fragmente zur Theorie des arithmetisch-geometrischen Mittels aus den Jahre 1797-1799, hrg. u. erläutert v. L. Schlesinger, 34 S. — III, 1912. L. Schlesinger. Ueber Gauss' Arbeiten zur Funktionentheorie. 143 S. — IV. 1918. A. Galle. Gauss als Zahlenrechner, 24 S. — V. 1918. P. Stäckel. Gauss als Geometer. 142 S. — VI. Ph. Maennchen. Die Wechselwirkung zwischen Zahlenrechnen und Zahlentheorie bei Gauss, 47 S. — VII. 1919. Ueber die astronomischen Arbeiten von Gauss. I. Theoretische Astronomie, 106 S. (Some at least of these papers are reprints from the *Nachrichten d. k. Ges. d. Wiss. zu Göttingen, Math. Physik. Klasse*). G. S.

Loeber, Kurt. Beiträge zur Lösung und Geschichte des Malfattischen Problems und seiner Erweiterungen. (*Diss.*), viii + 62 S. Halle a. S., 1914. 1818

Lorey, Wilhelm. Das Studium des Mathematik an den deutschen Universitäten seit Anfang des 19 Jahrhunderts, xii + 431 S., 13 Abb., 4 Taf. (*Abhdl in den mathematischen Unterricht in Deutschland*, III, 9). Leipzig, Teubner, 1916. 1818

B. — *Physical sciences and technology*.

Auerbach, Felix [1856-]. Ernst Abbe [1840-1905]. Sein Leben, sein Wirken, seine Persönlichkeit, nach den Quellen und aus eigener Erfahrung erschildert. (*Grosse Manner*, Bd. 5), XV + 512 S., Bildn. u. Abb. Leipzig, Akademische Verlagsgesellschaft, 1918. 1819

The same author has published (same publisher, 1919) a shorter biography (48 p.) in the collection edited by the « Siemens-Ring Stiftung zur Ehrung grosser Männer der Technik und der technischen Wissenschaften ». G. S.

Berzelius, Jac. Lettres publiées au nom de l'Académie royale des sciences de Suède par H. G. Soderbaum. Vol. II contenant les fasc. 4 et 5. Uppsala, Almquist, 1915-1916. 1819

For the preceding parts see *Isis*, I, 555; II, 275 — IV. Correspondance entre Berzelius et P. L. Dulong (1819-1837), 127 p.; 14 letters from Dulong and 26 from Berzelius. Portrait (A. Tardieu's engraving) — V. Correspondance entre Berzelius et G. J. Mulder (1834-1847), 356 p., 33 letters from Berzelius and 43 from the Dutch chemist Gerardus Johannes Mulder (1802-1880); with a biography and portrait of Mulder. G. S.

Buxbaum, Bertold. Der deutsche Werkzeugmaschinen- und Werkzeugbau im 19. Jahrhundert. *Beitr. zur Gesch. d. Technik u. Industrie*, Bd. 9, S. 97-129, 21 Abb. Berlin, 1919. 1818

Divided into 3 periods: 1. English influence down to about 1870 (p. 97-117). 2. American influence. 3. Autonomous development, from about 1879. G. S.

Fischer, Hugo. Der Bickfordsche Sicherheitszünder und die Errichtung der ersten Sicherheitszünderfabrik in Deutschland. *Beitr. z. Gesch. d. Technik u. Industrie*, t. 6, p. 55-78, 22 fig. Berlin, 1915. 1818

This history begins with the granting of Patent no. 6159, on Sept. 6, 1831 to William Bickford of Tuckingmill in Cornwall for his « miner's safety fuze ». G. S.

Fresnel, Augustin. [Broglie, Eure 1788 — Ville d'Avray 1827]. — De la Lumière. (Les Classiques de la Science, V) XIV + 132 p., 5 grav., 1 pl. Paris. Armand Colin, 1914. [2 fr. 50] 1818

Pour le compte rendu des quatres premiers volumes de cette collection, voir *Isis*, I, 770 et II, 277-279. Ce nouveau volume préparé par Henri Abraham, est consacré à l'article didactique « de la lumière » dans lequel Fresnel résumait la marche de ses idées et l'ensemble de sa théorie. Cet article parut en 1822 dans le supplément à la traduction française de la Chimie de Thomson. Le texte est conforme à celui inséré, avec les corrections de l'auteur, dans les œuvres de Fresnel, Paris, 3 vol. 1866. G. S.

Gibbs, Willard. — L'équilibre des substances hétérogènes. Exposé abrégé, traduit et complété de notes explicatives par G. Matisse, VIII + 102 p. Paris, Gauthier-Villars, 1919. 1818

A translation of Gibbs' memoir published in the *American Journal of Science*, 1878, with commentary. G. S.

Harrow, Benjamin. Eminent chemists of our time, XVI + 248 p., illustr. New York, VAN NOSTRAND, 1920. [2 $ 50] 1818

A series of popular biographies of contemporary chemists : PERKIN, MENDELÉEFF, RAMSAY, RICHARDS, VAN 'T HOFF, ARRHENIUS, MOISSAN, MARIE SKLODOWSKA CURIE, VICTOR MEYER, IRA REMSEN, EMIL FISCHER. There are good photographs and other illustrations and each essay is followed by a short critical bibliography. Some of the biographical material comes from private sources (MENDELÉEFF, RICHARDS, ARRHENIUS, Mad. CURIE, REMSEN, FISCHER). The value of this book would be much greater if we knew exactly which parts of it are original. The scientific and literary level of these essays is not very high, but they may prove stimulating to young or uneducated readers. G. S.

Hellman, G. Ein Sreit über das Vorhandesein des Luftdrucks im XIX. Jahrhundert. *Beitr. zur Gesch. d. Meteorologie*, t. II, p. 324-329. Berlin, 1917. 1815

Apropos of XIXth century writings denying the existence of atmospheric pressure ! G. S.

Keller, Karl. JAMES B. FRANCIS. Zum hundersten Wiederkehr seines Geburtstages. *Beitr. zur Gesch. d. Tech. u. Industrie*, t. VI, p. 79-94. Berlin, 1915. 1818

JAMES BICHENO FRANCIS, American engineer, inventor of the FRANCIS turbine (an inward-flow hydraulic turbine), born in Southleigh, Oxfordshire, May 15, 1815, died Sept. 18, 1892; biography with portrait and bibliography. G. S.

Kremers, Edward. The two sons of a Danish apothecary. *Journal of the American pharmaceutical association*, vol. 7, p. 620-625, 4 illustr. July, 1918. 1818

Apropos of HANS CHRISTIAN OERSTED and his brother ANDERS SANDOE OERSTED (1778-1860), a jurist who became prime-minister of Denmark. Mr. KREMERS shows that it is these two, who are the heroes of ANDERSEN's tale « The two brothers ». He also speaks of their birthplace, Rud Kjoebing, in the little island of Langland, opposite the Kiel harbor. G. S.

Le Chatelier, Henry. La fusion du platine et dissociation. Mémoires de SAINTE-CLAIRE DEVILLE, DEBRAY, TROOST, HAUTEFEUILLE, ISAMBERT, DITTE, JOANNIS, JOLY. (*Les Classiques de la Science*, VI), XII+120 p., 4 grav. Paris, COLIN, 1914. 1818

Collection of the original memoirs by Henry SAINTE-CLAIRE DEVILLE (la Martinique 1818-1881) and his school, as published between 1855 and 1884. With biographical notices. G. S.

Linde, Carl von. Aus der Geschichte der Kältetechnik. *Beitr. zur Gesch. d. Technik und Industrie*, t. VIII, p. 1-34, 17 Abb. Berlin, 1918. 1818

Extracts from the great inventor's autobiography, published under the title : « Aus meinem Leben und von meiner Arbeit ». G. S.

Meyer, Richard [1846-]. VIKTOR MEYER [1848-1897]. Leben und Wirken eines deutschen Chemikers und Naturforschers. (*Grosse Mäuner*, 4). XV + 471 S., Bildn., Abb. Leipzig, Akademische Verlagsgesellschaft. 1917. 1818

Miell, Aldo. L'origine della Gazetta chimica italiana. *Archivio di storia della scienza*, I, p. 460 461. Roma, 1920. 1918

Founded by Cannizzaro and Emanuele Paternò [1847-] in 1871; now published by the Associazione italiana di chimica generale ed applicata, Roma, via Tre Novembre, 154. G. S.

Moissan, Henri. [Paris, 1852 — Paris 1906]. Le Fluor. (*Les Classiques de la Science*, VII), XIV + 97 p. Paris, Colin, 1914. [2 fr. 50] 1918

This volume edited by Henri Gautier contains Moissan's original memoirs on fluorine, as they appeared in the *Annales de Chimie et de Physique* and the *Comptes Rendus* between 1885 and 1891. They were later republished in bookform : Le Fluor, Paris 1900. The text here reproduced is that of the original memoirs, save that the original notation in equivalents has been replaced by the atomic notation employed by Moissan only in his book of 1900. G. S.

Oechelhaeuser, Wilhelm von. Ein Beitrag zur Geschichte der Grossgasmaschine. *Beitr. zur Gesch. d. Technik u. Industrie*, t. VI, p. 109-151, 21 Fig. Berlin, 1915. 1918

Picard, Emile. Notice historique sur la vie et l'œuvre de Lord Kelvin, lue dans la séance publique annuelle de l'Académie des Sciences du 22 décembre 1919, 40 p. Paris, Gauthier-Villars, 1920. 1918

Thomälen, Adolf. Zur Geschichte der Dynamomaschine. Die Entwicklung des Dynamobaues bei der Firma Siemens und Halske (1866 bis 1878). *Beitr. zur Gesch. d. Technik u. Industrie*, Bd. 7, S. 134-168, 16 Fig. Berlin, 1917. 1918

Zeeman, P. Les lignes spectrales et les théories modernes de la physique. — *Scientia*, XXIX, p. 13-21, 1er janv. 1921. 1918

Les progrès de l'analyse spectrale depuis Newton, avec exposé des théories de Rutherford, Bohr, Sommerfeld. L. G.

C. — *Natural sciences*

Béguinot, Augusto e Zenari, Silvia. Illustrazione dell' erbario composto da G. B. Brocchi in Egitto e Nubia (1822-1826). Cenni introduttivi. *Archivio di Storia della Scienza*, I, p. 387-396. Roma, 1920. 1918

Giambattista Brocchi, b. Bassano (Veneto) 1772, d. Khartum 1826, is better known as a geologist and paleontologist; yet he was an encyclopædic naturalist. The present paper is chiefly devoted to his botanical work in Egypt. It also contains a short biographical sketch with complete bibliographical references, and a portrait. G. S.

Béguinot, Augusto e Zenari, Silvia. Illustrazione dell' erbario composto da G. Brocchi in Egitto e Nubia (1822-1826). *Archivio di Storia della Scienza*, II, p. 65-69, 185-198. Roma, 1921 1918

Du Bois-Reymond, Emil [1816-1896] Jugendbriefe an Eduard Hallmann. Zu seinem hundersten Geburtstage hrg. v. Estelle Du Bois-Reymond. 156 S. Berlin, Reimer, 1918. 1918

Du Bois-Raymond, Emil. Aus seinem Briefwechsel über die Geschichte der Naturwissenschaften (Schluss). *Mittl. zur Gesch. d. Medizin*, t. 19, p. 1-8, 1920. 1918

See *Isis*, III, 346.

Duclaux, Emile. PASTEUR The history of a mind. Translated by Erwin F. Smith and Florence Hedges. XXXII + 363 p. Philadelphia, SAUNDERS, 1920. 1818

The original work : PASTEUR, *Histoire d'un esprit*, appeared in 1896.

Ihmels, Carl. Die Entstehung der organischen Natur nach SCHELLING, DARWIN und WUNDT. Eine Untersuchung über den Entwicklungsgedanken, VI + 104 S. Leipzig, DEICHERT, 1916. 1818

Kraus, Edward. The future of mineralogy in America. *Science*, vol. 53, p. 219-226. March 11, 1921. 1818

The period of early development, 1785-1850 : The earliest papers appeared in 1785 in the *Memoirs of the American Academy of Arts and Sciences ;* BENJAMIN SILLIMAN was appointed in 1802 professor of chemistry, mineralogy, etc. in Yale. — The period of expansion, 1850-1900 — The modern period 1900-1920. G. S.

Merrill, George P. (*editor*). Contributions to a History of American [that is, U. S.], state geological and natural history surveys. Smithsonian Institution, U. S. National Museum, Bull. 109, XVIII + 549 p., illustr. Washington, 1920. 1818

Collection of administrative and other materials which will be indispensable to any historian of geology, or of science in general, in the U. S. The period dealt with is roughly from 1830 to 1885, but one survey at least (N. Carol.) began in 1824 (to be interrupted in 1828) and many documents bring us down to 1900. An excellent feature is the publication of a large amount of portraits, the more so that portraits of scientists, except the greatest, are often very difficult to obtain. Elaborate index. G. S.

Wolkenhauer, W. Aus der Geschichte der Kartographie. Kartographische Bibliographie, 1840-1917. *Deutsche geographische Blätter*, Bd. 38, p. 157-201, Bremen, 1917. 1818

Die moderne Kartographie ist charakterisiert durch die mit der Kippregel aufgenommenen Isohypsenkarten, durch die Einführung der Photographie (Photogrammetrie), durch die bedeutend fortgeschrittene Technologie für die Reduktion und Reproduktion der Karten, durch die Anwendung verschiedener Farben zur Höhendarstellung, durch die reliefartigen Kurvenkarten und den Stand unserer Schulkartographie. Ferner ist die Kartenentwurfslehre durch die theoretischen Untersuchungen TISSOTS in ein neues Stadium übergeführt. — A list of the main maps, geographical books and events in chronological sequence with critical notes, forming so to say, a summary of the annals of cartography. Six other such lists have been published for the previous periods in the same periodical from Bd. 27 (1904) on. G. S.

D. — *Medical sciences*

Du Mez, Andrew G. A century of the United States pharmacopoeia, 1820-1920 I. — The Galenical oleoresins *Bulletin of the University of Wisconsin* no. 764 (also in *Transactions of the Wisconsin Academy*, vol. XII), 288 p. Madison, Wisc. 1917. 1818

Flexner, Simon. Twenty-five years of bacteriology : a fragment of medical research. *Science*. vol. 52, p. 615-632, Dec. 31, 1920. 1818

Immunity. Anaphylaxis. Filterables. Spirochetes. Chemotherapy. Infection and survival. G. S.

Lister, Lord. Six papers. With a short biography and explanatory notes by Sir Rickman J. Godlee, Bt. (*Classics of medicine* ed. by Charles Singer) viii + 194 p., 4 pl. and 1 autograph letter. London, John Bale, 1921. [10 s.] 1918

The six papers edited by Lister's son-in-law are : On the early stages of inflammation 1858 ; on anaesthetics, 1861 ; on a new method of treating compound fractures, abscesses, etc. 1867 ; demonstrations of antiseptic surgery before members of the British medical association, 1875-1876 ; on the nature of fermentation, 1878 ; address on the present position of antiseptic surgery delivered before the international medical congress, Berlin 1890. The editor has provided a short preface to each of these papers and contributed a biography (25 p.) containing the essential facts. 1865 was the birth year of Antiseptic Surgery, though Lister's first publication on this subject dates of 1867 (quoted above). A useful little book. G. S.

E. — *Alia*

Bordeaux, Albert. Histoire des sciences physiques, chimiques et géologiques au xix^e^ siècle. 662 p. Paris, Béranger, 1920. 1918

This book divided in two parts, and the first part in 7 chapters : (1) mechanics and molecular physics ; (2) electricity ; (3) acoustics ; (4) heat ; (5) optics ; (6) chemistry ; (7) geology. The second part contains a series of tabloid biographies of the main scientists referred to in the first part — I cannot understand how the author has been able to persuade an important firm to publish a book as immature as this one. It is truly a monument of half-baked knowledge and muddled thinking. G. S.

Chamberlin, Thomas Chrowder. The founding of the Wisconsin academy of sciences, arts and letters. *Science*, vol. 52, p. 1-8, July 2, 1920. 1918

It was founded on Feb. 16, 1870. Chamberlin retraces the history of the first half-century of this young academy. G. S.

Eymieu, Antonin. La part des croyants dans les progrès de la science au xix^e^ siècle. Première partie : dans les sciences exactes, 3^e^ édition, ii + 272 p. Paris. Perrin, 1920. [5 fr.] 1918

Reviewed by D. E. Smith in *Bull. Amer. Math Soc.*, vol. 27, p. 29-31, 1920. Superficial and unconvincing : « a much stronger case could have been made and legitimately made, if the author had studied the problem with greater care ». G. S.

Fay, Charles Ryle. Life and labour in the nineteenth century. Being the substance of lectures delivered at Cambridge University in the year 1919, viii + 319 p. Cambridge University Press, 1920. 1918

Loria, Achille. Karl Marx. Transl. from the Italian, with a foreword by Eden and Cedar Paul, 92 p. London, Allen, 1920. 1918

Maine de Biran [Bergerac 1766-1824]. — **Mémoire sur les perceptions obscures... Publié par Pierre Tisserand (Les Classiques de la Philosophie, xii),** xii + 67 p. Paris, Colin, 1920. [3 fr.] 1918

The « Mémoire sur les perceptions obscures ou sur les impressions générales affectives et les sympathies en particulier » here published for the first time *in extenso* was read by Maine de Biran in 1807 before the « Société médicale de Bergerac » founded by him. This text is followed by four notes in which Maine de Biran discusses the opinions respectively of Royer

COLLARD, CH. V. DE BONSTETTEN, THOMAS REID and DUGALD STEWART. These notes are published from the MSS. and for the first time except the first already published by GÉRARD. The editor has added biographic and bibliographic notes ; the latter chiefly devoted to the MSS. is of particular interest. There are still many unpublished MSS., the bulk of which is at the library of the « Institut de France » (fonds NAVILLE). G. S.

Marvin, F. S. (*editor*) Recent developments in European thought. Essays arranged and edited by him. 306 p. (*The Unity Series*) Oxford University Press, 1920. 1818

Mély, F. de. L'abbé MIGNE. L'homme et l'œuvre. *Revue archéologique*, t. I, p 203-258. Paris, 1915. 1818

An extensive biography of the famous editor of the *Patrologies latine et grecque*, the largest collection of original texts ever published. The abbé MIGNE was born in Saint-Flour, Oct. 25, 1800, he died in Paris, Oct. 24, 1875. The original plan of his collection foresaw the publication of 1000 large 4o vol. (he edited 979 vol.). He was a man of great learning and almost unbelievable activity, a business man of genius, an extraordinary character. Three portraits of his are reproduced. G. S.

Raven, Charles E. Christian socialism, 1848-1854. London, MACMILLAN, 1920. 1818

Smith, David Eugene. DELAMBRE and the founder of the Smithsonian Institution. (Among my authographs, I) *American mathematical monthly*, t. 28, p. 64-65, 1921 1818

A letter from J B. J. DELAMBRE (1749-1822) to the Comte D'HUNEBOURG, Minister of War, to recommend to his benevolence JAMES SMITHSON, prisoner of war. Dated Paris 16 April 1809. G. S.

S. XX

Fuller, John Frederick Charles. Tanks in the Great War, 1914-1918, XXIV + 331 p., 7 pl. London, MURRAY, 1920. 1818

Hall, Thomas F. [1841-]. Has the North Pole been discovered? An analytical and synthetical review of the published narratives of the two Arctic explorers FREDERICK A. COOK and ROBERT PEARY, also of a review of the action of the U. S. government, 539 p., maps, charts etc. Boston, BADGER, 1917. 1818

HALL contends that neither COOK nor PEARY reached the pole. G. S.

Schmid, Bastian (*editor*). Deutsche Naturwissenschaft, Technik und Erfindung im Weltkriege. 26 cm., XVI+1008 S., Abbild. München, O. NEMNICH, 1919. 1818

A survey of scientific and technical progress made in Germany during the war, each chapter being contributed by a specialist. Introductory chapters deal with « Science and Culture » (RUDOLF STÜBE) and with the « Psychology of war and invention » (ROBERT SOMMER). The subjects considered are : physics; meteorology (S. GÜNTHER); aeronautics; photography; chemistry ; ballistics; arms; technology; transportation and communications; geology ; geography; ethnology; botany ; zoology ; bacteriology; hygiene; medicine and various medical branches (9 chapters); husbandry; forestry; scientific education (2 chapters). A final chapter treats the economical aspect of war. The treatment is popular throughout; this explains perhaps the omission of chapters devoted to mathematics and in the medical part, to sexual diseases. G. S.

Materials for the biography of contemporary scientists

(chiefly obituary notices)

I would be very grateful to readers of this section who happen to have complete information on some contemporary scientist, if they would kindly communicate it to me, especially if they would take the trouble to arrange it in conformity to the following notices, that it may be published without change. G. S.

Abney, Sir William de Wiveleslie (1843, July 24-1920, Dec. 2), Spectroscopy (infra-red), scientific photography. A. E. H. TUTTON in *Nature*, vol. 106, p. 476-477, 1920. 1918

Ameghino, Florentino (1854-1911). South American palæontology. An account of his life and works fills the first volume of his complete works published by the Argentine government: Obras completas y correspondencia cientifica. Ed. oficial, dirigida par A. J. TORCELLI, vol. I. Vida y obras del sabio. La Plata 1913; José INGEGNIEROS, Las doctrinas de A.; la tierra, la vida y el hombre, 221 p. Buenos Ayres, 1919. 1918

Andoyer, Henry (Paris, 1862 Oct. 1). Mathematics, astronomy (celestial mechanics). — G. BOUCHENY in *Larousse Mensuel*, t. 5, p. 29-30, 1920, with portrait and bibliography. 1918

Arnot, Frederick Stanley (-Johannesburg, 1914 May). Missionary, explorer. ERNEST BAKER. The life and explorations of FREDERICK STANLEY ARNOT, 334 p. London, SEELEY, 1920. 1918

Atkinson, George Francis (Raisinville, Mich. 1854-Tacoma, Wash. 1918). Botany. HARRY M. FITZPATRICK in *Science*, vol. 49, p. 371-372, 1919. 1918

Backlund, Oscar (Langhem, Wermland, 1846-Pulkovo, 1916). Astronomy. G. BIGOURDAN in *Rev. génér. d. sci*, t. 27, p. 701-702, 1916. 1918

Baeyer, Adolf von (Berlin, 1835-1917). Organic chemistry. W. H. PERKIN, *Nature*, vol. 100, p. 188-190, 1917; G. B. in *Geschichtsbl. f. Technik*, IV, 158-160, 1917; RICHARD WILLSTÄTTER in *Jahrbuch d. Bayer. Ak. d. Wiss.*, 1918. *Gesammelte Werke, 2 Bde.* Braunschweig, VIEWEG, 1905 (contains biogr. and autobiogr. information). 1918

Baird, John Wallace (W. Ontario, 1869 or 1873-Baltimore, 1919). Psychology, E. B. TITCHENER in *Science*, vol. 49, p. 393-394, 1919. 1918

Barrell, Joseph. (Providence, N. J. 1869-New Haven 1919). Geology. CHARLES SCHUCHERT in *Science*, vol. 49, p. 605-607, 1919; *Scientific monthly*, IX, p. 93-96 (portrait), 1919. 1918

Bartholomew, John George (Edinburgh, 1860, March 22-Cintra, 1920, April 13). Cartography. Geo. G. CHISHOLM in *Nature*, vol. 105, p. 238-239, 328, 1920. 1918

Battelli, Angelo (1862 March 28-1916 Dec. 11). Physics. *Revue génér, des sc.*, t. 28, p. 257, 1917; G. BILANCIONI. *Riv. di Storia critica*. t. 7, p. 200-201, 1916. 1918

Beck, Theodor (Darmstadt, 1839 June 3-ibid. 1917, July 30). History of science and technology. F. M. FELDHAUS in *Geschichtsbl. f. Technik*, t. IV, p. 161-162 (with portrait), 1917. 1918

Berendes, Julius. (Paderborn, 1837 March 23-Goslar, 1914 July 6). History of pharmacy. HERM. SCHELENZ, *Mitt. zur Gesch. d. Medizin*, t. 13, p. 620 621, 1914. 1918

Billings, John Shaw (1838-1913). Bibliography; history of medicine. *Isis*, III, 120. FIELDING H. GARRISON, JOHN SHAW BILLINGS, 432 p. New York, PUTNAM, 1915; S. WEIR MITCHELL and F. H. GARRISON, *National Acad. of Sciences*, vol. VIII, p. 375-416, 1917. 1918

Blanchard, Raphael (1858 or 1857-1919). History of medicine, medical zoology. F. H. GARRISON in *Science*, vol. 49, p. 391-392, 1919; K. SUDHOFF, *Mit. zur Gesch. d. Medizin*, vol. 18, p. 176, 1919. 1918

Bose, Sir Jagadis C. (Rarikhal in Vikrampur, E. Bengal 1858 Nov. 30). Physiology chiefly botanical. PATRICK GEDDES. The life and work of Sir J. C. B., XII + 259 p. London, LONGMANS, 1920; an editorial in the London *Times*, Dec. 16, 1919 entitled Eastern Monism was devoted to him; see also *Ibidem*, Dec. 17. 1918

Bourquelot, Emile. (Ardennes 1852?-1921 Jan. 26). Botanical chemistry, pharmacy. *Revue génér. d. sci.*, t. 32, 98, 1921; *Nature*, vol. 106, p. 836-837, 1921. 1918

Buchka, Karl Heinrich (Rostock 1856-1917 Febr. 16). History of chemistry: foundation of the *Archiv. f Gesch. d. Naturwiss.* KARL SUDHOFF, *Archiv f. Gesch. d. Naturw.*, t. VIII, p. I-IV (with portrait and bibliogr.) 1917; H. BORUTTAU, *Ibid.*, p. 124-128. 1918

Buchner, Eduard (München 1860-1917). Physiological chemistry, fermentation. C. HARRIES, *Chemiker Z.*, p. 753; G. B. *Geschichtsbl. f. Technik*, t. 4, 160. 1918

Bumstead, Henry Andrews (Pekin, Ill. 1870-1921 Jan. 1). Physics. J. J. T. in NATURE, vol. 106, p. 734-735, 1921; R. A. MILLIKAN, *Science*, vol 53, 84-85, 1921. 1918

Bureau, Edouard (Nantes -Paris 1918). Botany, chiefly palæobotany. HENRI LECOMTE, *Rev. génér. sc.*, t. 30, p. 97-98, 1919; HAYEM. Académie de médecine de Paris, 24 déc. 1918. 1918

Burrows, Ronald M. (1867 Aug. 16-1920). Ægean archeology. GEORGE GLASGOW, *Discovery*, I, p. 176-177; *Nature*, May 20, 1920. 1918

Candolle, Casimir de (Geneva, 1836-1918) Botany. R. CHODAT. *Arch. des sci. phys. et natur.*, vol. I, p. 5-28 (portrait) 1919; B. P. G. HOCHREUTINER, *Rev. génér. d. sci.*, t. 29, p. 625-626, 1918. 1918

Candolle, Augustin Pyramus de (England 1869-Vallon, nr. Geneva, 1920, May 9). Son of Casimir de C. Botany. Short note in *Nature*, vol. 105, p 365, 1920. 1918

Cantor, Moritz (Mannheim 1829-Heidelberg 1920). History of mathematics. FLORIAN CAJORI, *Bull. Amer. math. soc.*, vol. 27, p. 21-28, 1920; KARL BOPP, *Sitzungsber. d. Heidelberger Akad. d. Wiss.*, 16 p., 1920; S. GÜNTHER, *Mit. zur Gesch. d. Med.*, t. 19, p. 222, 1920. Festchrift zum 70. Geburtstage M. C., hrg. v. M. CURTZE u. S. GÜNTHER, Leipzig, 1899; *idem.* zum 80. Geburtstage hrg. v. S. GÜNTHER u. K. SUDHOFF, Leipzig, 1909. 1918

Carnegie, Andrew (Dumferline, Scotland, 1835-1919). Promotion of scientific research. Autobiography. XII + 385 p. London, CONSTABLE, 1920. See also *Isis*, III, p. 347. 1818

Chappuis, Pierre (1855-1916). Thermometry. CH. ED. GUILLAUME, P. CH. et le développement moderne de la thermométrie, *Revue génér. des sci.*, t. 27, p. 204-208, 1916; AUG. HAGENBACH, *Verhdl. d. Naturf. Ges.*, Basel, t. 27, p. 87-92, 1916. 1818

Chavannes, Emmanuel Edouard (Lyon 1865-Paris 1918). Sinology. *Isis*, III, p. 120; SAMUEL COULING, *New China review*, 1, p. 7-10, (portrait). Hongkong, 1919. 1818

Chun, Carl (1852-1914). Marine zoology. F. SCHWANGART, *Z. f. angew. Entom.*, I, p. 373-374, 1914; W. PFEFFER, *Ber. ü. die Verhdl. d. Kgl. Sächs. Ges. d. Wiss., Math. phys. klasse*, t. 66, p. 179-193 Leipzig, 1914. 1818

Clark, William Bullock (Brattleboro, Vt. 1860-1917). Geology of Maryland. *Science*, Aug. 3, 1917; also *Report of the Smithsonian Inst. for 1917*, p. 663-666; portait in *Scientific monthly*, V, p. 284, 1917. 1818

Crookes, Sir **William** (1832-1919). Physics. *Journal of the London Chemical soc.*, April 1920; DANIEL BERTHELOT, *Revue scientifique*, 1919, p. 336-337; *Rev. génér. d. sci.*, t. 30, p. 329-330, 1919; *Chemiker Z.*, p. 221, 1919. 1818

Darboux, Gaston (Nîmes 1842-1917). Mathematics. *Isis* III, 121; A. VOSS, *Jahr d. math. Ver.*, t. 27, p. 196-217, 1918. ERNEST LEBON. G.D., biographie, bibliographie analytique des écrits, 2e éd. entièrement refondue, 97 p. Paris, GAUTHIER-VILLARS, 1913. 1818

Dastre, Albert (1844-1917). Physiology. J. P. LANGLOIS, *Revue gén. des sci.*, 1918, p. 1-2; LOUIS LAPICQUE, *Revue scientifique*, p. 641-651, 1919. 1818

Deckert, Emil (1848-1916). Geography of N. America. OTTO MAULL. *Geograph. Z.*, t. 23, 57-62, 1917; E. OPPERMANN. *Geogr. Anzeiger*, t. 18, p. 8-11, 1917. 1818

Dedekind, Richard (1831-1916). Arithmetic, theory of numbers. PHILIP E. B. JOURDAIN, *The Monist*, t. 26, p. 415-427, 1916; E. LANDAU, *Nachr. d. Ges. Wiss.*, 21 p. Göttingen, 1917. Abhdl. aus den Gebieten der Mathematik, Physik, Chemie und beschr. Naturwiss. Festschrift zur Feier des 70. Geburtstages v. R. D. 1818

Delage, Yves (Avignon, 1854, May 13. — Sceaux, 1920, Oct. 7). Biology, zoology. HENRI BOUQUET, *Larousse mensuel*, (portrait) janv. 1921; M. GOLDSMITH, *Revue génér. des sciences*, t. 31, p. 709-711, 1920; J. ARTHUR THOMSON, *Nature*, vol. 106, p. 248, 1920. 1818

Duhem, Pierre (1861-1916). Physics, history of science. *Isis*, III, p. 121; ALDO MIELI, L'opera di P. D. come storico della scienza, *Riv. stor. crit.*, t. 8, p. 231-237, 259-269, 1917. 1818

Echegaray, José (Madrid, 1835-*ibid.* 1916). Science, mathematics (Nobelprize of *literature* in 1904!) L. TORRES Y QUEVEDO, *Rev. génér. des sc.*, t. 27, p. 637-638, 1916. HENRI CURZON, Un théâtre d'idées en Espagne. Le théâtre de José ECHEGARAY, 144 p. Paris, FISCHBACHER, 1912. 1818

Ehrlich, Paul (1854-1915). Medicine, pharmacology, immunity. Eine Darstellung seines wissenschaftlichen Wirkens. Festschrift zum 60. Geburtstage des Forscher, 676 p. Jena, FISCHER, 1914; *Chemiker Z*, p. 837-838, 1915; RICH. GONDER, *Arch. f. Schiffs- u. Tropenhygiene*, Bd. 19, S. 505-17, 1915; H. SACHS, *Z. f. Immunitätsforschung*, t. 26, S. 7-10, 1917. ISIS

Fabre, Jean-Henri (1823-1915). Entomology. *Isis*, II, p. 397; E. L. BOUVIER, La vie et l'œuvre de J. H. F., *Revue génér. sci.*, p 634-639, 1915; V. GUIZZARDI, Un naturalista animatore, 71 p., Bologna, Stab. poligrafici riuniti, 1919; CHARLES ROUX, J. F. en Avignon. Paris, LEMERRE, 1913. ISIS

Farlow, William Gilson (Boston, 1844-Cambridge, Mass. 1919). Cryptogamy. L. MANGIN, *Revue génér. d. sci.*, t. 30, p. 542-543; *Science*, vol. 51, p. 82, 1920; *Scientific monthly*, t IX. p. 94, 1919 (portrait); Sodales cotteriani cum carminibus nataliciis Farlovio suo S. P. D. 16 Jan. 1882 [Cambridge? 1882], 29 p. ISIS

Ferguson, John (1837-Glasgow 1916). History of chemistry. SUDHOFF, *Mit. zur Gesch. d. Medizin*, t. 19, p. 106, 1920 ISIS

Finsch, Otto (Warmbrunn, Silesia 1839-Braunschweig 1917). Zoology, ethnography. W. WOLKENHAUER, *Mit. zur Gesch. d. Med.*, t. 16, p. 263-265, 1917; E. OPPERMANN, *Geogr. Anzeiger*, t. 18, p. 41, 1917. ISIS

Fischer, Emil (Euskirchen, Rhenish Prussia 1852-1919). Organic chemistry. M. O. FORSTER, *Nature*, vol. 106, p. 326-327, 1920 (Summary of his memorial lecture to the Chemical Soc.); BENJ. HARROW, *Science*, vol. 50, p. 150-154, 1919; VERNON KELLOGG, E. F. after the war, *ibid*, p. 346-347; PAUL DIERGART, *Mit. zur Gesch. d. Med.*, t. 19, p. 121-123, 124, 1920; LOCKEMANN says (*Ibid.*, t. 18, p. 266) that FISCHER left a ms. entitled : « Geschrieben im Unglücksjahr 1918; BECKMANN, *Sitzungsber. Preuss. Ak. d. Wiss.*, p. 698-703, 1920. ISIS

Fischer, Otto (Altenburg 1861-1916). Medicine and mathematics! ROBERT STEIN, *Monatshefte für d. naturw. Unterricht*, t. 10, p. 140-142, 1917; WILH. LOREY, *Leopodina*, H. 53, p. 55-60, 1917; OTTO FISCHER, 1861-1916. Leipzig, 1917. ISIS

Fraser, Sir Thomas Richard (Calcutta 1841-1920 Jan.). Pharmacology. London *Times*, Jan. 6, 1920 J. A. G. in *Nature*, p. 505-506, Jan. 15, 1920. ISIS

Galli, Ignazio (Velletri 1841-Roma 1920). Meteorology, history of meteorology. GIUSEPPE MARTINELLI, *Archivio di Storia d. scienza*, t. I, p. 442-445 (with portrait and list of his historical writings). ISIS

Gorgas, William Crawford (Mobile, Alabama, 1854 Oct 3-London, 1920 July 4) Sanitary science and engineering. M. W. IRELAND, *Science*, vol 52, p. 53-54, 1920; *Nature*, vol. 105, p. 620-621, 1920. ISIS

Guareschi, Icilio (San Secondo Parmense, 1847-Torino, 1918). Pharmacy, chemistry; history of chemistry. RAFFAELLO NASINI, *Archivio di storia d. scienza*, t. I, p. 101-112 (portrait and bibliography), 1920; HERMANN SCHELENZ, *Mit. zur Gesch. d. Med.*, t. 18, p. 175, 1919. ISIS

Haeckel, Ernst (Potsdam, 1834-Jena, 1919 August). Biology, zoology. ERICH WASMANN, HAECKELS Kulturarbeit, 3te unveränderte Aufl. 58 S., Freiburg i. Br., HERDER, 1916; FRIEDR. MAURER, *Die Umschau*, 23. J., p. 666-669, 1919; ERICH ADICKES, KANT contra-HAECKEL, Erkenntnistheorie gegen naturwissenschaftlichen Dogmatismus. Berlin 1901; WILHELM BÖLSCHE E. H., ein Lebensbild, 269 p. Leipzig, SEEMANN 1900; LÉON A. DUMONT (1837-1876). H. et la théorie de l'évolution en Allemagne, 167 p., Paris, BAILLIÈRE, 1873; JOSEPH ENGERT, Der naturalistische Monismus H.'s auf seine wissensch. Haltbarkeit geprüft, 367 p. Wien, MAYER, 1907; CHWOLSON, O. D., HEGEL, HAECKEL, KOSSUTH und das 12. Gebot, 90 p. Braunschweig, VIEWEG, 1906; JOSEPH MCCABE, H 's critics answered, 128 p. London, WATTS, 1910; THEODOR MENZI, E. H.'s Welträtsel oder das Neomaterialismus, 128 p. Zürich, SCHULTHESS, 1901; ADOLF MÜLLER, Scheinchristentum und H.'s Welträtsel, 169 p. Gotha, PERTHES, 1901; HEINRICH SCHMIDT, Der Kampf um die Welträtsel, 2te Aufl. (unveränderte) 70 p. Bonn, 1900; WERNER SCHUNKE, Prüfung des v. E. H. vertretenen Monismus, 68 S. Leipzig, BARTH, 1913; RICHARD WAGNER, Aether und Wille oder H. und SCHOPENHAUER. Leipzig, SEEMAN, 1901; LESTER F. WARD, H.'s genesis of Man, *Pennsylvania Monthly*, April-July 1877.

1918

Hahn, Friedrich (Glauzig, nr. Köthen, Anhalt, 1852 March 3-Königsberg i Pr., 1917 Febr. 5). Geography. W. WOLKENHAUER, *Mit. zur Gesch. d. Med.*, t. XVI, p. 265-267, 1917 (with bibliogr.); J. PARTSCH, *Z. d. Gesell f Erdkunde*, p. 141-146. Berlin, 1917.

1918

Halévy, Joseph (Adrianople 1827-Paris 1917). Semitic philology and archæology MORRIS JASTROW jr., *Nation*, vol. 104, p. 378-379. New York, 1917; MOSES SCHORR, *Deutsche Literaturzeitung*, 1917. p. 595-601, 627-633.

1918

Hermann, Ludimar (Berlin 1838, Oct. 21-Königsberg, 1914 June 5). Physiology. F. B. HOFFMANN, LUD. HERMANN, nach einer am 24 Juni 1914 in der Aula der Albertus-Universität zu Königsberg i.Pr. gehaltenen Gedächtnisrede (*Sammlung anatom. u. physiolog. Vorträge*, Heft 27). Jena, FISCHER, 1914.

1918

Hewitt, Charles Gordon (nr. Macclesfield, England, 1885-Ottawa, Canada, 1920 Febr. 29). Canadian entomology. *Nature*, vol. 105, p. 75-76, 1920; *Natural History*, vol. 20, p. 202-203, 1920 (with portrait).

1918

Hill, George William (New York city 1838 March 3 — West Nyack, N. Y., 1914 April 16). Astronomy, mathematics (celestial mechanics). R. S. WOODWARD, *The astronomical journal*, vol. 28, no. 668, p. 161-162. Four vol. of his collected mathematical works have been hitherto published by the Carnegie Institution, 1905-1907; a fifth one will appear later; the first contains a portrait and a biography by HENRI POINCARÉ.

1918

Höfler, Max (1848 -1914 Dec. 8). History of popular (German) science. LUDWIG FRÄNKEL, Ein Musterschilderer und Erforscher deutschen Landes, Volkslebens und Volksglaubens *Deutsche Ge-*

schichtsblätter, vol. 17, p. 16-21, 1916; K. SUDHOFF, *Mit. zur Gesch. d. Med.*, vol. 14, p. 96, 1915; LUDWIG FISCHER, *Altbayerische Monatschrift*, vol. 13. 1818

Hooker, Joseph Dalton (1817-1911). Botany. *Isis*, t. I, p. 172, 311, t. III, p. 121; F. O BOWER, J. D HOOKER (*Pioneers of Progress*), 62 p. London. Society for the promotion of Christian Knowledge, 1919; SIR EDWIN RAY LANKESTER, *Quarterly Review*, Oct. 1918 (also *Smithsonian Report for 1918*, p. 585-601). 1818

Hopkins, Cyril G. (1866-1919 Oct. 6). Agricultural chemistry. E. DAVENPORT, *Science*, Oct. 24 1919; *Nature*, Jan. 1, 1920, p. 442-443; ROBERT STEWART, The scientific basis of the Illinois system of permanent soil fertility. *Science*, vol. 52, p. 21-25, 1920. 1818

Hopkinson, Bertram (1874 -1918). Mechanics. The scientific papers of B. H., collected and arranged by Sir J. ALFRED EWING and Sir JOSEPH LARMOR. XXVIII + 480 p. Cambridge University Press 1921 (with biographical notices by Sir ALFRED EWING and A. V. HILL). 1818

Horsley, Sir Victor (1857-Mesopotamia 1916). Neurology, neuropathology, neurosurgery. *Revue génér. d. sci.*, t. 27, p. 541, 1916; STEPHEN PAGET, Sir V.H. A study of his life and work, XI + 358 p. London, CONSTABLE, 1919. 1818

Houssay, Frédéric (1860-1920). Biology, zoology, philosophy of science. LOUIS ROULE, *Revue générale des sciences*, t. 31, p. 773-774, 1920; *Nature*, vol. 106, p. 701, 1921; *Isis*, IV, 115. 1818

Jacobi, Abraham (Hartum, Westphalia 1830-Bolton Landing, N. Y. 1919). Medicine, pediatrics. F. H. GARRISON, *Annals of medical history*, vol. II, p. 194-205, 1919 (with very beautiful portrait); *Science*, vol. 50, p. 102-104, 1919; *Scientific monthly*, t. IX, p. 186-189 (portrait). 1818

Jenkinson, John Wilfred (1871-Gallipoli 1915). Embryology. *Studies in the history and philosophy of science*, vol. I, p. 57-58, 1917 (portrait and bibliography). 1818

Jordis, Eduard (1868-1917). Colloidal chemistry. FERD. HENRICH, *Chemiker Zeitung*, 1917, p. 869; M. BUSCH. *Z. f. angew. Chem.*, 1918, p. 13 Bildnis); M. K. HOFFMANN. *Kolloid-Chemie*, vol. 23, p. 49-56, 1918. 1818

Jourdain, Philip Edward Bertrand (1879 Oct. 16-1919 Oct. 1). Mathematics, logic, history of mathematics and mechanics. Life with portrait in *The Monist*, t. 30, p. 161-192, including memories of his youth by his sister MILLY; *Nature*, vol. 104, p. 117, 1919. 1818

King, Leonard William (1869-1919). Babylonian archæology. R. CAMPBELL THOMPSON, *Journal R. Asiatic Soc.*, 1919, 625-626; H.R. HALL, *Nature*, vol. 104, p. 27-28, 1919. 1818

Kraus, Gregor (Bad Orb, 1841-Würzburg, 1915 Nov.). Botany, history of botany. HERM. SCHELENZ, *Mit. zur Gesch. d. Med.*, t. 15, p. 81, 1916; H. KNIEP, *Verhdl. d. phys. medic. Gesellschaft zu Würzburg*, t. 44, p. 173-196 (portrait), 1916. 1818

Kropotkin, Peter A. (1842 Dec. 9-Dmitrov, nr. Moscow, 1921 Jan. 28). Geography, general science, sociology. ABRAHAM CAHAN, *The Nation*, Febr. 9, 1921, New York; *Nature*, vol. 106, p. 735-736, 1921; Memoirs of a Revolutionist. XIV + 502 p. Boston, HOUGHTON 1899; LAURENTIUS. K.'s Morallehre und deren Beziehungen zu NIETZSCHE, Dresden, 1896. 1818

Laisant, Charles-Ange (Basse-Indre, Loire infér. 1841-Asnières, Seine, 1920). Mathematics. G. BOUCHENY, *Larousse mensuel*, t. V, p. 237 (portrait); JACQUES BOYER, *Revue générale des sciences*, t. 31, p. 397-398, 1920. 1818

Lang, Arnold (c. 1855-1914 Nov. 28). Zoology. Aus dem Leben und Wirken von ARNOLD LANG. Dem Andenken des Freundes und Lehrers gewidmet, IV + 286 p. Jena, FISCHER, 1916. 1818

Lister, Joseph. First baron (1827-1912). Surgery, antisepsy. Sir ST. CLAIR THOMSON. A house-surgeon's memories of JOSEPH LISTER, *Annals of medical history*, t. II, p. 93-108, 16 illustr.; FRANCIS R. PACKARD, *Ibid.*, p. 208-209; *Nature*, vol. 104, p. 322, 1919, vol.105, p. 654, 1920. See also *Isis*, I, 311; III, 122; IV, 159. 1818

Lockyer, Sir **Joseph Norman** (Rugby 1836-1920). Astro-spectroscopy. JEAN BOSLER, *Revue générale des sci.*, t. 31, p. 605 607, 1920; A. FOWLER, *Nature*, vol 105, p. 831-833; *Nature*, vol. 105, 781-784, 1920, vol 106, 20-25 (memorial tributes from many scientists), 1920. See *Isis*, III, 468. 1818

Mach, Ernst (Turas, Moravia, 1838-1916). Physics, psychology, history and philosophy of mechanics. See *Isis*, III, 122. ANTON LAMPA, E. M. Verlag Deutsche Arbeit, 64 p. Prag 1918; seven notices quoted in *Mit. zur Gesch. d. Medizin*, t 15. p. 391-393, 1916; HUGO DINGLER, *Monatshefte für den naturwiss. Unterricht*, Bd 9, S. 321-329, 1916; GEORG HELM, *Sitzungsber. d. naturw. Ges. Isis*, p. 45-54. Dresden, Jahr. 1916; TH. HÄBLER. Ein Brief von E. M. *Z. f. math. u. naturw. Unterricht*, t. 49, p. 96 98, 1918; RUD. WLASSAK, Gedächtnisrede, 48 p. Leipzig, BARTH, 1917. 1818

Markham, Sir **Clements Robert** (Stillingfleet, nr. York, 1830-London, 1916). Geography, history of geography. G. REGELSPERGER, *Revue génér. d. sci*, t. 27, p. 134, 1916; HERM. SCHELENZ, *Mit. zur Gesch. d. Medizin*, t. 15, p. 195, 1916. 1818

Maspero, Sir **Gaston** (1846-1916). Egyptology. See *Isis*, III, 122. EDOUARD NAVILLE, *Journal of Egyptian archæology*, t. III, p. 227-234 (portrait). 1818

Maxim, Sir **Hiram Stevens** (Sangerville, Maine 1840-Streatham, England 1916). Inventor (guns, explosives, etc.). P. FLEURY MOTTELAY, The life and work of Sir HIRAM S. MAXIM. With an introd. by Lord MOULTON, XXVII + 230 p. London, LANE, c. 1920. My Life. London, METHUEN, 1915. 1818

Mechnikov, Il'ia Il'ich (Ivanavka, nr. Kharkoff 1845-1916). Biology. J. P. LANGLOIS, *Rev. génér. des sci.*, t. 27, p. 497-498, 1916; OLGA METCHNIKOFF [his wife]. Vie d'ELIE METCHNIKOFF. Paris, HACHETTE, 1921. 1818

Meltzer, Samuel James (in Curland, N. W. Russia, 1851-1920). Physiology. W. H. HOWELL, *Science*, vol. 53, p. 99-106, 1921. 1818

Mercier, Charles Arthur (1852-Bournemouth, 1919). Psychopathology. *Nature*, vol. 104, p. 50, 1919; London *Times*, 1919, Sept. 3 and 4. 1819

Meyer, Ernst von (Kassel 1847- 1916). Chemistry, history of chemistry. RUDOLF ZAUNICK *Geschichtsblätter f. Technik*, t. 5, p 244-246, 1918 (referring to other obituary notices); F. HENRICH, *Mit. zur Gesch. d. Med.*, t. 15, p. 277-281, 1916 (portrait); ARTHUR HANTSCH, *Ber. über die Verhdl. d. Kgl. Sächs. Ges. d. Wiss., math. phys. Kl.*, t. 68, p. 245 251, 1916: ERNST VON MEYER, Lebenserrinnerungen, 159 p. Als Manuskript gedruckt. [Writteu at the end of 1914, published after his death by his family]. 1819

Meyer, Frank N. (Amsterdam, — China, 1918, June 2). Planthunter. DAVID FAIRCHILD. A hunter of plants, *Nat. geogr. magaz.*, t. 36, p. 57-77. Washington, 1919; *Idem*, *Journal of Heredity*, t. 10, p. 276-280, 1919 (both articles illustrated). 1819

Milhaud, Gaston (Nimes, 1858-1918). History and philosophy of science. ANDRÉ LALANDE, *Revue générale des sciences*, t. XXIX, p. 657-658, 1918; ED. GOBLOT, *Isis*, t. III, p. 391-395, 1921 (portrait). 1819

Millosevich, Elia (Venezia 1848-1919). Astronomy, history of astronomy, GIORGIO ABETTI, *Archivio di storia d. scienza*, t. I, p. 446-447. Roma, 1920. 1819

Mills, Lawrence Heyworth (New York 1837-1918). Avestan philology and archæology. PAUL CARUS, *The Monist*, t. 28, p. 314-316, 1918; L. C. CASARTELLI, *Journal R. Asiatic Soc.*, 1919, p. 109-113 (with bibliogr.). 1819

Morse, Harmon Northrop. (Cambridge, Vermont 1848-1920). Chemistry, osmotic pressure. IRA REMSEN, *Science*, t. LII, p. 497-500, 1920.

Murray, Sir **James A. H.** (1837-1915). English lexicography. London *Times*, July 27, 1915, 2 col.; HENRY BRADLEY, *Proc. British Academy*, t. VIII, 7 p., 1920 1819

Olszewski, Charles (1846-1915). Physics, liquefaction of gases. H. KAMERLINGH ONNES, *Chemiker Z.*, 1915, p. 517, M. VON SMOLUCHOWSKY, *Die Naturwissenschaften*, t. V, p. 738, 1917. 1819

Osler Sir **William** (Bond Head, Ontario 1849 - Oxford 1919). Medicine, medical history and bibliography. WILL. S. THAYER, *The Nation*, vol. 110, p. 104-106, New York, 1920; KARL SUDHOFF, *Mit. zur Gesch. d. Medizin*, t. XIX, p. 106-107, 1920; whole number of July 1919 of the *Bull of the Johns Hopkins Hospital*, Baltimore, devoted to him; London *Times*, Dec. 30 and 31 1919; EDWARD C. STREETER, Osler as a bibliophile, *Boston medical and surgical journal*, t. CLXXXII, p. 335-338, 1920; series of articles devoted to him in the *Annals of medical history*, t. II, p. 157-190, 1919; F. H. GARRISON, *Science*, t. LI, p. 55-58, 1920; C. A., *Nature*, Jan. 8, 1920, p. 472. Contributions to medical and biological research dedicated to Sir W. O. BART., M. D., F. R. S. in honor of his 70th birthday, July 12, 1919, by his pupils and co-workers. 2 vol. New York, HOEBER, 1919 (apropos of the presentation of this book see F. H. GARRISON, *Science*, t. L, p. 244-246, 1919; apropos of another memorial meeting, *Ibidem*, t. LI, p. 341-342, 1920); Dr HARVEY CUSHING, PETER BENT BRIGHAM Hospital, Boston, has been requested by Lady OSLER to prepare a biography of Sir WILLIAM OSLER. 1819

Peary, Robert Edwin (Cresson-Springs, Pa , 1856-1920). Exploration, discovery of N. Pole, 1909, April 6 DONALD B. MACMILLAN, P. as a leader, *National geogr. mag.*, t. XXXVII, p. 293-317; GILBERT GROSVENOR. P'. s explorations, *Ibidem*, p. 318 322; G. REGELSPERGER, *Revue génér. d. sci.*, t. XXXI, p. 165-166, 1920; H. R. M., *Nature*, t. CIV, p. 699-700, 1920; GEORGE BORUP, A tenderfoot with P. 2nd ed. London, NASH, 1911; S. D. FESS. The N. Pole aftermath. Speech in Congress. Washington, 1915, 27 p. — *Isis* IV, 160. 1818

Peirce, Benjamin Osgood (1854-1914). Physics. EDWIN H. HALL, *Biog. memoirs of Nat. Acad. of Sciences*, vol. III, p. 437-466. Washington, 1919. 1818

Peters, Hermann (Neuhaus a. Elbe 1847-1920). History of pharmacy. HERMANN SCHELENZ. *Mit. zur Gesch. d. Med.*, t. 19, p. 223-224, 1920 (cfr. also *Ibid.*, t XVIII, p. 153). 1818

Pfeffer, Wilhelm (nr. Kassel, 1845-1920). Botanical physiology, osmotic pressure. WILH. OSTWALD, *Chemiker Z.*, p. 145, 1920; V. H B., *Nature*, t. CV, p. 302, 1920; G. J. P. *Science*, t. LI, p. 291-292, 1920. 1818

Pickering, Edward Charles (Boston, 1846 - Cambridge, Mass. 1919). Astronomy chiefly stellar. *Science*, t. XLVII, p. 333-337, 1918; HENRY NORRIS RUSSELL, *Ibidem*, t. XLIX, p. 151-155, 1919; JEAN BOSLER, *Revue générale des sciences*, t XXX, p. 133-135, 1919; SOLON IRVING BAILEY, *Astrophysical journal*, t. L, p. 233-244, 1919. 1818

Poincaré, Henri (1854-1912). Mathematics, astronomy, physics, philosophy of science. See *Isis*, t. I, p. 172, 311. LOUIS ROUGIER, La philosophie géométrique d'H. P. Paris, ALCAN, 208 p , 1920; R. C. ARCHIBALD, *Bull. Am. math. soc.*, Dec. 1915, vol. 22, p. 125-136 (with a supplement to LEBON's bibliography); ROBERT D'ADHÉMAR, H.P., 63 p. Paris, BLOUD, 1914; RENÉ BERTHELOT. Le pragmatisme chez NIETZSCHE et chez P. 416 p. Paris, ALCAN; 1911; GASTON DARBOUX, *Acad. des sciences, Mémoires*, t. LII. Paris, 1914; VITO VOLTERRA, JACQUES HADAMARD, PAUL LANGEVIN, PIERRE BOUTROUX, H. P., l'œuvre scientifique et philosophique. Paris, ALCAN, 1914; FOREST RAY MOULTON, *Popular astronomy*, t. XX, Dec. 1912; CARLO SOMIGLIANA, *Atti R. Acc. d. sci.*, t. XLIX, p. 45-54. Torino, 1914. 1818

Poynting, John Henry (1852-1914). Physics. See *Isis*, t. III, p 122. Collected scientific papers, XXXII + 768. Cambridge, University Press, 1920, contains a portrait and somes obituary notices. 1818

Ramanujan, Srinivasa (nr. Madras, 1888-1920). Mathematics. G. H. HARDY, *Nature*, t. CV, p. 494-495, 1920; E. H. NAVILLE, *Nature*, t. CVI, p. 661-662 (two excellent notices). 1818

Ramsay, Sir William (1852-1916). Chemistry. See *Isis*, t. III, p. 122; IV, p 154. CH MOUREU, *Revue scientifique*, 1919, p. 609-618; BENJ. HARROW, *Scientific monthly*, t. IX, p. 167-168, 1919. 1818

Rayleigh, Lord (**John William Strutt** third baron R., Langford Green, Essex, 1842-1919). Physics. Scientific papers, 6 vol. Cambridge University Press, 1899-1920 (portrait). LOUIS BRUNET. *Revue génér. d. sci.*, t XXX, p. 461-462, 1919; *The Monist*. t. XXX, p. 474-475, 1920; *Scientific monthly*, t. IX, p. 379-381 (portrait). 1818

Retzius, (Magnus) Gustaf (Stockholm, 1842-1919). Histology of the nervous system, anthropology. OLOF LARSELL, *Scientific monthly*, t. X, p. 559-569, 1920 (portrait); R. ANTHONY, *Revue génér. d. sci.*, t. XXX, p. 637, 1919; G. RETZIUS, Verzeichnis der veröffentlichen Werke u. Schriften, 1864-1906, 25 p. Stockholm, Aftonbladetstryckeri, 1906. 1818

Righi, Augusto (Bologna, 1850-1920). Physics, Sir OLIVER LODGE, *Nature*, t. CV, p. 753-754, 1920; LAVORO AMADUZZI, *Scientia*, t. XXVIII, p. 467-472, 1920; AUGUSTUS TROWBRIDGE, *Science*, t. LII, p. 122-123, 1920. 1818

Rydberg, Johannes Robert (Halmstad, Sweden, 1854-1919). Spectroscopy, Rydberg (hydrogen) constant. *Nature*, t. CV, p. 525, 1920; *Revue génér. d. sci.*, t. XXXI, p. 469, 1920. 1818

Saccardo, Pier Andrea (Treviso, 1845-Padova, 1920). Mycology, history of Italian botany. PAUL VUILLEMIN. *Revue génér. d. sci.*, t. XXXI, p. 233-234, 1920; *Nature*, t. CV, p. 76, 1920; G. B. DE TONI. *Archivio di storia d. scienza*, t. I, 376-378 (portrait and bibliography of historical writings). 1818

Schloesing, Jean Jacques Théophile (Marseille, 1824-Paris, 1919). Agricultural chemistry. L. GUIGNARD, *Revue scientifique*, 1919, p. 503-504; G. ANDRÉ, *Revue génér. d sci.*, t. XXX, p. 293-295, 1919; PAUL EHRENBERG, *Chemiker Z.*, p. 305, 1919. 1818

Schwarzhild, Karl (Francfurt a. M., 1873-1916). Astronomy, physics. OTTO BLUMENTHAL, *Jahresber. d deuts. math. Ver.*, t. XXVI, p. 56-75, 1917; ALBERT EINSTEIN, *Sitzungsber. d. preus Ak. d. Wiss.*, p. 768, 1916. 1818

Scott-Moncrieff, Sir Colin (Campbell) (1836-1916). Engineering. MARY ALBRIGHT HOLLINGS, the life of Sir C. C. S. M., edited by his niece, XII + 374 p., illustr. London, MURRAY, 1917. 1818

Smoluchowski, Marian von (nr. Vienna, 1872 - Cracow, 1917). Molecular physics, discussion of irreversibility. ALBERT EINSTEIN. *Die Naturwissenschaften*, t. V, p. 737, 1917; R. LORENZ, *Jahresbericht des physikal. Vereins*, Frankfurt a. M., p. 3-16, 1917-1918. 1818

Suess, Eduard (London, 1831-Vienna, 1914). Geology. *Isis*, t. III, p. 123. W. M. DAVIS *American Journal of science*, Sept. 1919 (important); EMIL TIETZE, Einige Seiten ü. E. S., *Geol. Reichsanstalt*. Wien, 1917. 1818

Thompson, Silvanus Phillips (York, 1851-1916). Physics, history of physics. JANE SNEAL and HELEN G. THOMPSON, S. P. T., his life and letters, IX + 372 p. London, FISHER UNWIN, 1920; Portrait in *Scientific Monthly*, t. III, p. 311, 1916. 1818

Turner, Sir William (cty. of Lancaster, 1832-1916). Anatomy, comparative anatomy (Cetacea), anthropology, medicine. R. ANTHONY, *Rev. génér. d sci.*, t. XXVII, p. 165-166, 1916; A. LOGAN TURNER (his son), SIR W. TURNER, K. C. B., F. R. S. A chapter in medical history, XVII + 514 p. London, BLACKWOOD, c. 1919. 1818

Tylor, Sir Edward Burnett (Camberwell, 1832-1917). Anthropology, ethnology. *Nature*, t. XCVIII, p. 373-374, 1917; Anthropological essays presented to him in honour of his 75th birthday, Oct. 2, 1907.

Oxford, CLARENDON Press, 1907 (with biographical essay by A. LANG, and an extensive bibliography). 1918

Vambéry, Armin (Szerdahely, island of Schutt 1832 - Seebenstein 1913). Travel in Central-Asia; Oriental philology. R. TSCHUDI, *Islam*, t. V, p. 107-108, 1914. ARMINIUS VAMBERY, Life and adventures, written by himself, 9th ed., 340 p London. UNWIN, 1914; *Idem*, the story of my struggles. 2 vol. London, UNWIN, 1904. 1918

Vidal de Lablache, Paul (Pézenas, Herault, 1845 - Tamaris sur mer, Var, 1918). Geography, H. FROIDEVAUX, *Larousse mensuel*, t. V, p. 83 84, 1920 (portrait); GUST. REGELSPERGER, *Revue génér. d. sci.*, t. XXIX, p. 257-258, 1918. 1918

Weismann, August (1834-1914). Biology. R. VON HANSTEIN, *Naturwiss. Wochenschrift*, t. XIV, p. 113-120, 129-136; ERNST GAUPP, A. W., sein Leben und sein Werk, VIII + 297 p. Jena, FISHER 1917. GEORG JOHN ROMANES (1848-1894). An examination of Weismannism, IX + 221 p. Chicago, Open Court, 1893. 1918

Welch, William Henry (Norfolk, Conn. 1850-) Medicine, hygiene. SIMON FLEXNER, *Science*, t. LII, p. 417-433, 1920 (an introduction to the Collected Papers compiled in his honor on the occasion of his 70th birthday, 3 vol., Baltimore, JOHNS HOPKINS Press. 1920). 1918

Werner, Alfred (Mulhouse, Alsace, 1866-Zurich, 1919). Chemistry inorganic, valence *Science*, t. LI, p. 607-608, 1920; LOUIS BRUNET, *Rev. génér. d. sci.*, t. XXXI, p. 265-266, 1920; PHILIPPE A. GUYE, *Journal de chimie physique*, t. XVII, p. 638, 1919. 1918

Weyl, Theodor (1851-1913). Hygiene, history of hygiene. E. BÖRNSTEIN, *Ber. d deutsch. chem. Ges.*, t. XLVIII, 18 p Berlin, 1914; CARL KOEHNE, *Mit. zur Gesch. d. Medizin*, t. XIV, p. 72-73, 1915. 1918

White, Andrew Dickson (1832-1918). History of science and civilization. GEORGE LINCOLN BURR, *Nation*, p 577-578. New York, 1918. Autobiography, 2 vol. New York, Century, 1905 (with a bibliography and portraits). 1918

Wolkenhauer, August (Bremen, 1877-1915). History of geography. — S. GÜNTHER, *Mit. zur Gesch. d. Medizin*, t. XIV, 162-165, 1915 (with bibliography). 1918

Wundt, Wilhelm (Neckarau, nr. Mannheim, 1832-1920). Psychology, philosophy. EDW. BRADFORD TITCHENER, *Science*, t. LII, p 500 502, 1920; G. DAWES HICKS, *Nature*, t. CVI, p. 83-85, 1920. Festschrift W.W. zum 70. Geburtstage überreicht von seinen Schülern, 2 vol., Leipzig, ENGELMANN, 1902; EDMUND KÖNIG. W W. Seine Philosophie und Psychologie, 207 p. (portrait, Stuttgart, FROMMAN. 1901; 3te. Aufl., 232 p. 1909; OSWALD PASSKÖNIG, Die Psychologie des W.W., VIII + 188 p. Leipzig, SIEGISMUND, 1912, 1918

Zeuthen, Hieronimus Georg (Grimstrup, Jütland, 1839-1920). History of mathematics. GINO LORIA, *Archivio di storia della Scienza*, t. I, 447-451, 1920 (with bibliography); Festskrift til H.G. Z fra venner og elever i anledning af hans 70 aars foedselsdag 15. Februar 1909. Koepenhavn, HOEST, 1909, 156 p. (portrait). 1918

PART II

—

Historical Classification

Including only the materials which could not be included in Part I, — the fundamental (centurial) classification.

1 and 2. — ANTIQUITY

Bidez, J. La liturgie des mystères chez les néo-platoniciens. *Bull. de l'Acad. R. de Belgique (lettres)*, n° 5, p. 415-430. Bruxelles, 1919. 1919

Explaining a programme of investigations on ancient liturgy and ritual of which almost nothing is known. Such a programme could be carried through only by international cooperation. It is of real interest to the historian of science because liturgy was intimately connected with alchemy. The first step will be to make a complete catalogue of all Greek (also Latin and Oriental) Mss. dealing with alchemy and other occult sciences, oracles, or containing Orphic hymns, gnostic and hermetic writings. This is an immense untertaking but its accomplishment will give us a deeper knowledge of the ancient history of chemistry and technology and also of Hellenistic and Roman philosophy. Incidentally, BIDEZ criticizes the work of CHARLES-EMILE RUELLE, BERTHELOT's collaborator. BIDEZ does not seem to know the many papers refuting DIELS' theory that the making of alcohol is an ancient invention. G. S.

Breasted, James Henry. The origins of civilization. Reprinted from the *Scientific Monthly*, Oct. 1919, Nov. 1919, Dec. 1919, Jan. 1920, Febr. 1920, March 1920, with many illustrations. 1919

(I) From the old stone age to the dawn of civilization; (II) The earliest civilization and its transition to Europe. These two lectures were delivered before the National Academy of Sciences in Washington in April 1919 as the 7th series of lectures on the W. E. HALE Foundation. Both the text of this great synthesis and the illustrations are extremely suggestive. G. S.

Gardner, Percy [1846-]. A history of ancient coinage, 700-300 B.C., XVI + 463 p. Oxford, CLARENDON Press, 1918. 1918

Hellmann, G. Die Witterungsangaben in den griechischen und lateinischen Kalendern. *Beitr. zur Gesch. d. Meteorologie*, Nr. 7, Bd. II, S. 137-166. Berlin, 1917. 1919

Some ancient parapegmata contained meteorological observations, and even gave forecasts for particular days. These observations were not systematic however. The ποιεῖν and σημαίνειν of celestial bodies was soon considered as a reality. Hence one cannot attach much value to these so-called observations. HELLMANN studies successively : (I) The Egyptian meteorol. data contained in PTOLEMY's calendar ; (II) the old Greek meteor. calendars ; (III) COLUMELLA, POLEMIUS SILVIUS and ARTIUS ; (IV) CLODIUS TUSCUS. G. S.

Lattes, Ella. De quelques objections contre les parentés italiques de l'Etrusque. *Scientia*, t. XXVII, p. 395-398. Bologna, 1920. 1919

Discussion des objections de M. MEILLET. Voir *Isis*, III, p. 470. G. S.

Lehmann-Haupt, C.F. Historisch-metrologische Forschungen. (2). Die hebräischen Masse und das pheidonische System; (3). Die Mine des Königs und die Mine (des Landes) *Klio*. t. XIV, p. 345-376. Leipzig, 1914. 1818

Schubart, Wilhelm. Einführung in die Papyruskunde, VII + 508 p. Berlin, WEIDMANN, 1918. 1818

Tenne, A. Kriegschiffe zu den Zeiten der alten Griechen und Römer, 76 p., 8 pl. Oldenburg, STALLING, 1915. 1818

Warren, Herbert Langford (1857-1917]. The foundations of classic architecture, XIV + 357 p. New York. MACMILLAN, 1919. 1818

3. — ASIA

Ferrand, Gabriel. Le K'ouen-Louen et les anciennes navigations interocéaniques dans les mers du Sud. *Journal Asiatique*, t. XIII, p. 239-333, 431-492; t. XIV, p. 5-68, 201-241. Paris, 1919. 1818

Recueil de textes relatifs au pays de K'ouen-Louen, et aux îles que les Arabes appellent Ḳâmrûn et Ḳomr; aussi de documents orientaux ayant trait aux migrations de peuples de la Haute Asie en Inde transgangétique, puis en Indonésie et de l'Indonésie occidentale à Madagascar et sur la côte d'Afrique voisine. G. S.

Saussure, Léopold de. La symétrie du zodiaque lunaire asiatique. *Journal Asiatique*, t. XIV, p. 141-148. Paris, 1919. 1818

« Le problème de l'origine et de l'évolution du zodiaque lunaire asiatique sous ses diverses formes (mânâzil arabes, nakṣastra hindous et sieou chinois) soulève des questions d'ordre historique, astronomique et philologique. » Cette courte note a pour objet d'attirer l'attention sur la symétrie diamétrale qui présente la projection des nakṣastra sur l'équateur de XXIV^e^ siècle av. J. C.; la projection des sieou sur le même équateur présente une symétrie beaucoup plus régulière. Les projections des nakṣastra et des sieou sur l'écliptique sont bien moins symétriques L'auteur démontre que « le but primordial du zodiaque lunaire (ou plutôt luni-solaire) a été de déterminer le lieu sidéral du soleil par l'observation du lieu sidéral de la pleine lune, grâce à un système d'étoiles fondamentales choisies en opposition par couples; ce qui explique l'inégalité des divisions, l'admission de très petites étoiles (4^e^ grandeur dans l'Inde, 5^e^ grandeur en Chine), la diffusion de ce zodiaque d'un bout à l'autre de l'Asie et la convention traditionnelle des mêmes étoiles fondamentales ». G. S.

EASTERN ASIA

Grosilier, George. La batellerie cambodgienne du VIII^e^ au XIII^e^ siècle de notre ère. *Revue archéologique*, t. 5, p. 198-204, 9 fig. Paris, 1917. 1818

A propos d'une jonque chinoise, semblable aux jonques modernes, figurée sur un bas-relief du Bayon (Angkor Thom). G. S.

Swingle, Walter T. Orientalia. Report of the Librarian of Congress for the fiscal year ending June 30, 1920, p. 187-194. Washington, 1920. 1818

The Oriental section of the Library of Congress is growing very fast as this report clearly shows. For inst. the Library contains what is perhaps the largest collection of Chinese official gazetteers to be found outside of China : it now comprises 1 025 different gazetteers !, and this includes a part of the manuscript of the great Mongol gazetteer (*Ta Yüan i t'ung chih*). Other accessions are : a copy of the classified manuscript catalogue of the Library of Canton ; a Korean reprint (early xvth cent.) of T'ang Shên-wei's famous herbal (xith cent.) of which the Library owns already 7 Chinese and I Japanese ed., etc... The Library doubtless has the largest collection of Chinese collectanea or *ts'ung shu* outside of the Far East.

G. S.

WESTERN ASIA

Crawford, S. J. The decipherment of the Hittite language. *Journal of the Royal Asiatic Society*, p 1-13. London, January 1919. 1919

A summary of Friedrich Hrozny's research with a short account of the Hittite question The Hittites first appear in history in 1930 B. C. warring with Babylonia and to them is probably due the overthrow of Hammurabi's dynasty. Their empire culminated in the xivth and xiiith cent. under Subbiluliuma and his successors and appears to have waned about the beg. of the xiith cent. In the xivth and xiiith cent. Hittite was an independent Indo-European language, very closely related to Latin. — It was probably the Hittite empire which kept the Minoans out of Asia Minor, and its downfall which smoothed the path of the Achæans. Crawford suggests also a possible connection between the Hittites and the Etruscans. G. S.

Hogarth, David George. Hittite Seals. With particular reference to the Ashmolean collection, xii + 108 p., 10 pl. Oxford, Clarendon Press, 1920. 1919

Hrozny, Friedrich. Die Sprache der Hethiker, ihr Bau und ihre Zugehörigkeit zum indogermanischen Sprachstamen. Ein Entzifferungsversuch (*Boghazköi-Studien, 1*), xv + 246 p. Leipzig, Hinrichs, 1917. 1919

Hrozny, Friedrich. Hethitische Keilschrifttexte aus Boghazköi in Umschrift, mit Uebersetzung und Kommentar. Lief. I (*Boghazköi-Studien, 2*). Leipzig, Hinrichs, 1919. 1919

King, L. W. Note on the Hittite problem. *Journal of Egyptian archæology*, t. 4 p. 190-193. London, 1917. 1919

A criticism of F. Hrozny's claim to have solved the problem and to have proved that the Hittite language was of Indo-European character (*Mitt. d. deutschen Orientgesell.*, no. 56, Dez. 1915). G. S.

Strzygowski, Josef. Die Baukunst der Armenier und Europa. Ergebnisse einer vom kunsthistorischen Institute des Universität Wien 1913 durchgeführten Forschungsreise, planmässig bearbeitet. Mit 828 Abb. samt einer Karte. 2 Bde, 4°, xii + 888 S. Wien, Schroll, 1918. 1919

Contains a large amount of unpublished material on Armenian architecture. From the theoretical point of a view a sequel to the author's « Altai-Iran und Völkerwanderung » (*Isis*, IV, p. 189), Leipzig, 1917.

G. S.

4. — BABYLONIA AND ASSYRIA

Fotheringham, J. K. Babylonian measures and the δάκτυλος. *The Observatory*, vol. 42, p. 46-51, 1919. 1818

The Babylonian « finger » as a unit is the same as our digit, the twelfth part of the Moon's diameter. J. L. E. D.

Landsberger, Benno. Der Kultische Kalender der Babylonier und Assyrer. (I) Die altbabylonischen Lokalkalender (*Diss.*). Leipzig, Pries, 1914. 1818

Langdon, Stephen H. Sumerian epic of paradise, the flood and the fall of man. 98 p., 7 pl Philadelphia, University Museum, 1915. 1818

Lehmann-Haupt, C. F. Die babylonische Zeiteinheit von 216 Minuten, ihre Beziehungen und ihre Verbreitung. *Zeitschrift für Ethnologie*, Heft 2 u. 3, p. 101-131, 1919. (published May 1920). 1818

A study of two Babylonian periods of time : the little *uddasallû* (216 minutes) and the large *uddasallû* (14 h. 24 m). The former represents 9 sixtieths of a day and the 180th part of a sidereal month ; the latter is 4 times larger and represents the duration of the longest day in Babylonia. The author discusses their relation to one another but without being able to find which was used first. G. S.

Mercer, Samuel A. B. A Sumero-Babylonian sign list, to which is added an Assyrian sign list and a catalogue of the numerals, weights and measures used at various periods, VI + 244 p. New York, Columbia University Press, 1918. 1818

Mercer, Samuel A. B. Religious and moral ideas in Babylonia and Assyria, XIV + 130 p. Milwaukee, Wisconsin, Morehouse Co, 1919. 1818

Teloni, G. C. L'écriture babylonienne et assyrienne. *Scientia*, t. 28, p. 165-200. Bologna, 1920. 1818

(I) Ce qu'en savaient les anciens ; (II) Cette écriture en général ; (III) Origines probables et développement ; (IV) Est-il possible de retrouver l'image primitive des signes babyloniens et assyriens ?

5. — BIBLE

Legge, F. The Society of Biblical Archæology. *Journal of the Royal Asiatic Society*, p. 25-30. London, Jan. 1919. 1818

Retraces the history of this society born in 1870 and now amalgamated with the R. Asiatic Soc. — Their Proceedings are now incorporated with the *Journal of the R. A. S.* G. S.

Masterman, E. W. G. Hygiene and disease in Palestine in modern and in biblical times, XV + 69 p., 5 pl. London, Palestine exploration fund, 1919. 1818

Naville, Edouard. The text of the Old Testament The Schweich lectures, 1915, VIII + 82 p. London, Milford, 1916. 1818

Thomsen, Peter. Die Palästinaliteratur. Eine internationale Bibliographie in systematischer Ordnung, Ed. I-III. Leipzig, 1895-1914. 1818

Thomson, Peter Palästina und seine Kultur in fünf Jahrtausenden. Nach den neuesten Ausgrabungen und Forschungen dargestellt. 2 neubearb. Auflage (*Aus Natur und Geisteswelt*), 127 p., 37 illustr. Leipzig, TEUBNER, 1917. 1818

6. — BYZANTIUM

Diehl, Charles. Histoire de l'empire byzantin, XI + 247 p. Paris, PICARD, 1919. 1818

Excellent summary containing lists of emperors, chronological tables, etc. G. S.

7. — CHINA

Boyer, A. M.; **Rapson, E. J.** and **Senart, E.** Kharosthī Inscriptions discovered by Sir AUREL STEIN in Chinese Turkestan. Part I : Text of inscriptions discovered at the Niya site, 1901, transcribed and edited. Royal 4°, VIII + 154 p., 6 pl. Oxford, CLARENDON Press, 1920 1818

Dingle, Edwin John (*editor*). The new atlas and commercial gazetteer of China. A work devoted to its geography and economic and commercial development. Containing 25 bilingual maps with complete indexes and many coloured graphs. Compiled and translated from the latest and most authoritative surveys and records. Shanghai, North China Daily News and Herald, [1917]. 1818

Erkes, Eduard und **Schindler, Bruno**. Zur Geschichte der europäischen Sinologie. *Ostasiatische Zeitschrift*, t. V, p. 105-115. Berlin, 1917. 1818

Interesting summary of Sinological studies in various European countries and in the United States. G. S.

Petrucci, Raphael (1872-1917). Chinese painters. A critical study with a biographical note by LAURENCE BINYON, 25 illustr., 155 p. New York, BRENTANO, 1920. 1818

Saussure, Léopold de. Le système astronomique des Chinois. *Archives des sciences physiques et naturelles*, vol. 1, p. 186-216, 561-588, illustr. Genève, 1919. 1818

This very important publication does not duplicate the author's previous publ. in *T'oung Pao*, 1909-1914 (see *Isis*, t. III, p. 131). The latter were written for sinologists, the former for astronomers ; they complete one another. GINZEL'S account of Chinese astronomy (*Hdb. d. Chronologie*, I, 1906) is entirely wrong. A knowledge of ancient Chinese astronomy (that is anterior to the Burning of the Books, B. C. 213) is necessary to understand the cosmological beliefs upon which Chinese civilisation is based. The memoir is subdivided as follows : (I) Description du système ; (II) Preuves de son antiquité ; (III) Rôle fondamental de l'étoile polaire ; (IV) La théorie des cinq éléments ; (V) Changements dynastiques et réformes de la doctrine. G. S.

Saussure, Léopold de. Le système astronomique des Chinois. *Archives des sciences physiques et naturelles*, t. 2, p. 214-231, 325-350, illustr. Genève, 1920. 1818

(VI) Le symbolisme zoaire ; (VII) Les anciens mois turcs ; (VIII) Le calendrier ; (IX) Le cycle sexagésimal et la chronologie ; (X) Les erreurs de la critique. « Les Chinois ont su élaborer, en perfectionnant le zodiaque lunaire asiatique, un système astronomique très remarquable, basé, au point de vue tropique, sur le solstice d'hiver ; au point de vue sidéro-solaire, sur la détermination des lieux du soleil par ceux de la pleine lune ; au point de vue calendérique sur la concordance des lunaisons cardinales avec le milieu des saisons ; au point de vue cosmologique sur la division du firmament en cinq parties dont une centrale (polaire) et quatre périphériques.... On aurait tort de supposer que ce système impliquât une exacte connaissance des mouvements célestes et une grande précision des observations.... La seule opération vraiment précise de l'astronomie antique est l'établissement de la symétrie des étoiles déterminatrices, qui date de l'époque créatrice [dans la haute antiquité]... La grande valeur du système chinois ne réside pas dans la précision de détail, mais dans son caractère synthétique et déterministe.... Il représente la plus ancienne conception unitaire, synthétique et déterministe du monde. Et depuis les origines jusqu'à nos jours, il a constitué le cadre intellectuel de la civilisation chinoise » (p. 348-350).
G. S.

Saussure, Léopold de. Une Société des Nations dans l'antiquité chinoise. *Journal de Genève*, 16 février 1920, (2 col.). 1819

Schindler, Bruno. Die Prinzipien der chinesischen Schriftbildung. *Ostasiatische Zeitschrift*, t. IV, p. 284-315. Mit 18 Schrifttafeln. Berlin, 1916. 1819

Stübe, R. Die Erfindung des Druckes in China und seine Verbreitung in Ostasien *Beitr. zur Gesch. d. Technik u. Industrie*, t. 8, p. 82-93. Berlin, 1918. 1819

(I) China ; (II) Japan ; (III) Korea. G. S.

8. — EGYPT

Breasted, James Henry. The earliest boats on the Nile. *Journal of Egyptian archæology*, t IV, p. 174-176, 2 pl. 1917 ; cfr. also *Ibid.* p. 255. 1818

Apropos of the Nubian reed-floats observed by the author and compared by him to the earliest Egyptian boats and to the « catamaran » so common in Pacific and Malay waters. « It is quite evident that Egyptian navigation by way of the Red Sea affected devices in the East Indian world, just as it did in the Mediterranean » — The reed « catamarans » used by fishermen on the west coast of South America may possibly belong to the same family ?
G. S.

Capart, Jean. Les origines de la civilisation égyptienne. Conférence faite à la Société d'Anthropologie de Bruxelles, le 27 avril 1914, 34 p. + XVI pl. Bruxelles, VROMANT, 1914. 1818

Les monuments préhistoriques égyptiens nous viennent exclusivement des nécropoles de la Haute-Egypte. Cependant il est très probable que la civilisation pharaonique est originaire du Delta. La civilisation primitive du Delta était probablement complexe : libyenne — sémitique ; c'était une civilisation non pas continentale, mais méditerranéenne. Plus tard les vrais Egyptiens du Delta envahirent la Haute Egypte jusqu'alors habitée par une population africaine. G. S.

Capart, Jean. Les monuments dits Hycsos (Recherches d'art égyptien, I). Réimprimé des *Annales de la Société royale d'Archéologie de Bruxelles*, t. XXVII, 1913, p. 121-156, 46 p. Bruxelles, VROMANT, 1914. [6 fr.] ISIS

CAPART's theory is briefly that the monuments called Hycsos by MARIETTE, attributed by GOLENISCHEFF to the XIIth Dyn. and by PETRIE to the end of the Old Kingdom really belong to a period anterior to the IVth dyn., that is to a period of artistic formation. On the basis of an artistic analysis CAPART puts these monuments in the following order : LUDOVISI bust, Tanis carriers, Fayoum bust, Tanis sphinx. I must confess that CAPART's argument has not destroyed my confidence in GOLENISCHEFF whose comparisons between the Tanis sphinxes and the statue of AMENEMHET III are very striking. But CAPART's theory may be correct with regard to the other monuments. There is a long way from the LUDOVISI bust to the Tanis sphinxes ! G. S.

Gardiner, Allan H. The nature and development of the Egyptian hieroglyphic writing. *Journal of Egyptian archæology*, vol. II, p. 61-75. London, 1915. ISIS

This evolution can be summed up as follows : Picture-writing, then ideograms. Three sorts of ideograms developed : (1) with strict pictorial meaning, whence ordinary determinatives ; (2) with extended pictorial meaning, whence generic determinatives ; (3) with phonetic meaning (phonograms) whence uniliteral or alphabetic signs, biliteral signs, triliteral signs. G. S.

Griffith, F. Ll. Meroitic studies. *a*) The numerals. *Journal of Egyptian Archæology*, vol. III, p. 22-24, 1 pl. London, 1916. ISIS

Journal of Egyptian Archæology. Published by the Egypt Exploration Fund 13, Tavistock Place, W. C. I. London, 1914, etc. ISIS

See *Isis*, t. II, p. 252. This journal contains a critical bibliography edited for Christian Egypt by STEPHEN GAZELEE, later W. E. CRUM ; for Hellenistic Egypt, F. Ll. GRIFFITH ; for Græco-Roman Egypt, H. IDRIS BELL, MARCUS N. TODD, and F. Ll. GRIFFITH ; for Ancient Egypt, F. Ll. GRIFFITH — Vol. I to V, (1918), have been read for *Isis*, but the readers of *Isis* should refer themselves to the above mentioned bibliographies. G. S.

Knudtzon, Jorgen Alexander. Die El-Amarna-Tafeln. 2 Bde. Leipzig, HINRICHS, 1908 [1907]-1915. ISIS

The first volume (XII + 1007 p.) (1907-1909) contains the titles and translation of the Amarna letters which date of the reigns of AMENHOTEP III and AMENHOTEP IV (IKHNATON), of the XVIIIth Dynasty, — that is, the end of the XVth cent. and the beginning of the XIVth. The second vol. (VIII + p. 1009 to 1614, 1909-1915) contains notes, glossaries, indexes by OTTO

WEBER, ERICH EBELING, WINCKLER and KNUDTZON. This fundamental publication is a part of the « Vorderasiatische Bibliothek, Section 7, Letters ». G. S.

Lieblein, Jens (Christiania 1827-Eidsvold 1911). **Recherches sur l'histoire et la civilisation de l'ancienne Egypte, 3 fascicules. Christiania, CAMMERMEYER, 1910-1914.** 1818

Fasc. I, 192 p., 1910 : Les XVIII premières dynasties. — Fasc. II, p. 193-384, 1911 : Les dyn. XVIII à XXVI. — Fasc. III, p. 385-476, 1914 : L'origine et la propagation de la civilisation égyptienne. Invention de l'écriture alphabétique. Les relations entre l'Egypte et l'Asie occidentale avec l'Europe. L'héritage égyptien passe aux Grecs. — L'ouvrage se termine (p. 466 etc.) par une notice biographique par WILHELM SCHENCKE. G. S.

Lucas, A. The use of Natron by the ancient Egyptians in mummification. *The Journal of Egyptian archæology*, t. I, p. 119-123. London, 1914. **The use of Bitumen by the ancient Egyptians in mummification.** *Ibidem*, p. 241-245. 1818

Mace, Arthur C. and Winlock, Herbert E. The tomb of Senebtisi at Lisht, XXII + 132 p., 35 pl. New York, Metropolitan Museum, 1916. 1818

Mackay, Ernest. Proportion squares on tomb walls in the Theban necropolis. *Journal of Egyptian archæology*, vol. 4, p. 74-85, illustr. 1917. 1819

« It was the custom of the ancient Egyptians, from the time of the Old Kingdom, to draw the human figure upon squares, in order to assure its correct proportions ». The author has made a study of these squares with a view to determining the canon of Egyptian figure representation as applied in the Theban necropolis during the XVIIIth Dyn. and later. G. S.

Sethe, Kurt. Von Zahlen und Zahlworten bei den alten Aegyptern und was für andere Völker und Sprachen daraus zu lernen ist. Ein Beitrag zur Geschichte von Rechenkunst und Sprache. (*Schriften d. Wissensch. Ges. in Strassburg*), VIII + 147 p., 3 pl. Strassburg, TRÜBNER, 1916. 1818

This « fundamental » publication has been extensively reviewed by BATTISCOMBE GUNN in the *Journal of Egyptian archæology*, t. III, p. 279-286. Says GUNN : « for the first time an Egyptologist of the very front rank has dealt with a part of his science not merely as a special contribution to Egyptology, but with a view to the light it throws upon similar phenomena among other peoples and languages ». It is divided as follows : Das Ziffernsystem der Aegypter. — Kardinalzahlen. — Bruchzahlen. — Ordinalzahlen. — Distributivzahlen. G. S

Smith, G. Elliot. Egyptian mummies. *Journal of Egyptian archæology*, t. I, p. 189-196, 2 pl. London, 1914. 1818

Earliest body, as yet known, exhibiting signs suggestive of an attempt at mummification, Sakkara, IInd Dyn. Earliest actual mummy, probably Vth Dyn., found at Medûm 1892 by Prof. PETRIE, now in the Museum of the R. College of Surgeons, London. The culmination of the embalmers' art occurred during the XVIIIth and XIXth Dyn. ; during the XXIst Dyn. the embalmers attempted to restore the actual form of the body by packing material under the skin. From this time onwards the art rapidly deteriorated. G. S.

9. — GREECE

Dickins, Guy (d. 1916). Hellenistic sculpture, XIV + 100 p. Oxford, CLARENDON Press, 1920. 1818

Dittenberger, Wilhelm (1840-1906). Sylloge inscriptionum graecarum a GUILELMO DITTENBERGER condita et aucta nunc tertium edita. Volumen primum. Documenta secundum temporum ordinem digesta usque ad pacem Naupactiam a. 217/6. 1915; vol. alterum. A pace Naupactia ad IUSTINIANUM, 1917. Leipzig, HIRZEL. 1818

Heiberg, J. L. Théories antiques sur l'influence morale du climat. *Scientia*, t. 27, p. 453-464. Bologna, 1920. 1818

Discussion basée sur un écrit ionien du v^e^ siècle av. J. C. *De l'air, de l'eau et des régions*, attribué à HIPPOCRATE mais très probablement antérieur et sur le manuel astrologique, dit *Tetrabiblos*, de PTOLÉMÉE. La comparaison de ces deux écrits prouve la décadence qu'avait subie la sagesse grecque. G. S.

Herford, Mary A. B. A handbook of Greek vase painting, XXII + 125 p., 11 pl. Manchester, University Press, 1919. 1818

Hess, Jean Jacques. Καλαμίτης, Magnetnadel. Festgabe ADOLF KAEGI. p. 189-190. Frauenfeld, 1919. 1818

Καλαμίτης, deriving from κάλαμος; Ital. calamita, Fr. calamite; Arabic, qaramit (854 A. D.). HESS would conclude from this etymology that the Chinese knowledge of the magnet was transmitted to the West by the Greeks. G. S.

Kahrstedt, Ulrich. Die spartanische Agrarwissenschaft. *Hermes*, Bd. 54, p. 279-294. Berlin, 1919. 1818

Pfeiffer, Erwin. Studien zum antiken Sternglauben. (Στοιχεῖα, II) VI + 132 p. Leipzig, TEUBNER, 1916. 1818

Poulsen, Frederik. (Keeper of the Ny Carlsberg Museum, Copenhagen). Delphi. Translated by G. C. RICHARDS with a preface by PERCY GARDNER, XII + 338 p., 164 fig. London, GYLDENWALD, 1920. 1818

Based upon a first-hand study of archæological evidence and also upon the published volumes of the *Fouilles de Delphes*. Important because of the immense prestige of Delphi, the navel of the world, in Greek times. G. S.

Stace, W. T. A critical history of Greek philosophy, XIV + 386 p. London, MACMILLAN, 1920. 1818

Veazie, Walter B. The word φύσις. *Archiv für Geschichte der Philosophie*, Bd. 33, p. 1-22, Berlin, 1920. 1818

According to BURNET (Early Greek Philosophy) the title περὶ φύσεως, so commonly given to philosophical works of the VIth and Vth cent., means simply « concerning the primary substance » and the word φύσις always means that which is primary, fundamental and persistent. VEAZIE denies the correctness of these views and proposes other interpretations. G. S.

Viedebantt, Oskar. ERATOSTHENES, HIPPARCHOS, POSEIDONIOS. Ein Beitrag zur Geschichte des Erdmessungsproblems im Altertum. *Klio*. t. 14, p. 207-256. Leipzig, 1914. 1818

10. — INDIA

Avalon, Arthur (pseudonym). The Serpent Power being the Shatchakra-nirūpana and Pādukā-Panchaka. Two works on Tantrik Yoga, translated from the Sanskrit with introduction and commentary (coloured diagrams of the Centres), XII + 292 + 184 p. London, LUZAC, 1919. 1818

Brown, Percy. Indian Painting *(The Heritage of India)*. 115 p., 17 pl. Calcutta, The Association Press; London, Oxford, University Press [n. d. 1919?] 1818

Popular account of Buddhist, Hindu and Muhammedan painting in India, with bibliography and list of main collections. (I) History (Early period, Buddhist, Medieval, Mogul, Rajput, Modern); (II) Description of Indian painting. G. S.

Coomaraswamy, Ananda. The Dance of Śiva. Fourteen Indian essays, 140 p., 27 pl. New York, The Sunwise Turn, 1918. 1818

Fourteen capital essays (some of which have already appeared in various periodicals) which anyone wishing to understand Indian thought, ought to read. These essays have a great didactic value for the Western reader; they may help him to overcome his materialistic and industrialistic tendencies The illustrations are very interesting. G. S.

Farquhar, John Nicol. An outline of the religious literature of India (*The Religious Quest of India*), XXVIII + 451 p. London, MILFORD, 1920. 1818

Garbe, Richard. Die Sâmkhya Philosophie. Eine Darstellung des indischen Rationalismus nach den Quellen. 2te umgearb. Aufl. XII + 412 p. Leipzig, HAESSEL, 1917 [1st. ed., 1894]. 1818

Ghate, V. S. Le Vedanta. Etude sur les Brahmasūtras et leur cinq commentaires, XLIV + 146 p. Tours, ARRAULT, 1918. 1818

This new study is important because it is based upon the whole evolution of Vedantism, while DEUSSEN's System (see *Isis*. t. II, 407) was based only upon BĀDARĀYANA'S interpretation. G. S.

Havell, E. B. A Handbook of Indian Art. Issued to members of the India Society 1920, XVI + 222 p, 79 pl. London, JOHN MURRAY, 1920. 1818

The name of the author is a sufficient guarantee of accuracy with regard both to details and to essentials. A history of art which is not built upon a deep understanding of the souls and hearts of the artists is fundamentally wrong, however accurate the historical facts may be. Mr. HAVELL is a man of great knowledge and insight and his history is excellent, but the reader should be warned that its title is misleading. It is not a history of art, but chiefly of architecture. Sculpture is disposed of in 42 p. and painting

in 18! It would have been fairer to leave the two last sections out, and to call the book, a handbook of Indian architecture. The illustrations are abundant and very good. G. S.

Hopkins, Edward Washburn. Epic Mythology. 277 p. (*Grundriss der indo-arischen Phil. u. Altertumskunde*, III, 1, B). Strassburg, TRÜBNER, 1915. 1918

Keith, Arthur Berriedale. The Sāmkhya system. A history of the Sāmkhya philosophy (*Heritage of India*) 109 p. Calcutta, Association Press, 1918. 1918

[Lājpat Rāya]. The Arya Samaj. An account of its origin, doctrines and activities with a biographical sketch of the founder by LAJPAT RAI. Preface by SIDNEY WEBB, XXVI + 305 p. London, LONGMANS, 1915. 1918

Macnicol, Nicol. Psalms of Maratha saints. One hundred and eight hymns translated from the Marathi (*Heritage of India*), 94 p. Calcutta, Association Press, 1919. 1918

Mookerji, Radhakumud. Local government in ancient India. With foreword by the Marquess of CREWE, 2nd ed. rev. and enl. XXVII + 338 p. Oxford, CLARENDON Press, 1920. 1918

Oldenberg, Hermann. Die Lehre der Upanishaden und die Anfänge des Buddhismus, VIII + 366 p. Göttingen, Vandenhoeck, 1915. 1918

Pereira, A. B. de Bragança. O sistema das castas (Ensaio histórico-sociológico). Separata dos nos 1 a 4 (1920) do *Oriente Portugués*, 45 p. Nova Goa, 1920. 1918

Smith, Vincent A. The Oxford history of India from the earliest times to the end of 1911 [Appendix to 1918], XXIV + 816 p. Oxford, CLARENDON Press, 1919. 1918

Stephen, Dorothea Jane. Studies in early Indian thought. 176 p. Cambridge University Press, 1918. 1918

Vallauri, Mario. I fondamenti generali della medicina indiana. (Saggi sulla medicina indiana, I) *Archivio di storia della scienza*, t. II, p. 70-88. Roma, 1921. 1918

A general survey of Indian medicine based upon a first-hand study and a comparison of the fundamental texts. The author does not attempt to compare Indian with non-Indian medical ideas. He proposes to publish later three other studies devoted respectively to Indian anatomy, pathology and therapeutics. G. H.

Walter, Howard Arnold. (d. 1918) The Ahmadiya movement (*Religious Life of India*), 185 p. Calcutta, Association Press, 1918. 1918

11. — IRAN

Browne, Edward Granville. A history of Persian literature under Tartar dominion (A. D. 1265-1502), XVI + 586 p. Cambridge University Press, 1920. 1818

Jackson, A. V. Williams. Early Persian Poetry. From the beginnings down to the time of FIRDAUSI. With ten illustr., XXIV + 125 p. New York, MACMILLAN, 1920. 1818

A sympathetic account of Early Persian Poetry from the days of ZOROASTER to the Shâhnâma and even to the XIth cent. Many original translations illustrate the text. (I) Early period (from the VIIth cent. B. C. to the VIIth cent. after Christ); (II) New awakening of Persian song after the Muham. conquest, the Ṭâhirid and Ṣaffârid periods (IXth c.); (III) Rays from lost minor stars, earlier Sâmânid period (ab. 900-950 A. D.); (IV) RŪDAGĪ (or RŪDAKĪ, ab. 880-954), a herald of the dawn; V) Snatches of minstrel song: from the later Sâmânid period to the era of MAḤMŪD of Ghaznah (2nd half of X); (VI) DAḲĪḲĪ (d. after 975); (VII) The round table of MAḤMŪD of Ghaznah: court poetry (beg. of XI); (VIII) and (IX) FIRDAUSĪ (ab. 935-1025) and the Shâhnâma. There is a list of the poets included (ab. 30) with short biographical notes, a bibliography and an index. G. S.

12. — ISLAM

Diez, Ernst. Die Kunst der islamischen Völker. (Handbuch der Kunstwissenschaft begründet v. FRITZ BURGER) 28 cm., XXII + 218 S., 5 Taf., 288 Abb. Berlin, Akademische Verlagsgesellschaft, 1915. 1818

Deals chiefly with architecture, only one short chapter (8 p.) dealing with miniature, another (15 p.) with arts and crafts. There are two introductory chapters, one devoted to preislamic art in the Near East (Seleucidian, Arsacidan, Sassanian), the other containing brief outlines of Mohammedan history and customs. G. S.

Evans, Lady [Maria Millington]. Lustre Pottery. 31 cm., XX + 148 p., 24 pl. London, METHUEN, 1920. 1818

(I) Lustre pottery of the Near East; (II) Ealy lustre pottery of Spain; (III) Technique of Valencian lustre pottery. Hispano-Moresque ware of the XVth-XIXth centuries; (IV) Export of Spanish ware. Deruta and Gubbio lustre. Lustre pottery in England. Index. G. S.

Frank, Josef. Zur Geschichte des Astrolabs (Habilitationsschrift, Auszug) 33 p. Erlangen, 1920. 1818

See under ***Astronomy***.

Horten, M. Die religiöse Gedankenwelt der gebildeten Muslime im heutigen Islam, XXIV + 184 p. Halle a. S., NIEMEYER, 1916. 1818

(A) Die Logik; (B) Die Weltanschauung: (*a*) Die theoretische: Gott und Welt. (I) Die Metaphysik; (II) Die Einzelwissenschaften. [(1) Gott; (2) Die Welt im allgemeinen, die Weltgesetze; (3) die Geister; (4) der Mensch; (5) die Kōperwelt).] (*b*) Die praktische Weltanschauung: das Menschenleben, die Ethik. — Schlusswort u. Ueberblick. G. S.

Lippmann, Edmund O. von. Zucker-Monopole im Mittelalter. Die Deutsche Zuckerindustrie, Berlin [reprint of 2 columns on one page, undated]. 1918

Describes two remarkable attempts to monopolize the production of sugar. The first by the caliph ALHAKIM-BI-AMR-ILLAH who reigned in Egypt from 996 to 1021 (this is the earliest attempt of this kind) ; the second, also in Egypt, by the Sultan BARSBAÏ (1422-1438). G. S.

Margoliouth, David Samuel. The early development of Mohammedanism. IX + 265 p. London, WILLIAMS and NORGATE, 1914. 1918

Mžik, Hans von PTOLEMAEUS und die Karten der arabischen Geographen. *Mitt. d. k. k. geogr. Gesell.*, Wien, t. LVIII, 27 p., 7 pl., 1915. 1918

Rivoira, G. T. Architettura Musulmana. Sue origini e suo sviluppo. IX + 309 p., 341 ill., 1 pl. Milano, HOEPLI, 1914. 1918

English transl., London, Milford, c. 1919.

Wiedemann, E. und **Hauser, F.** Ueber Vorrichtungen zum Heben von Wasser in der islamischen Welt. *Beitr. zur Gesch. d. Technik u. Industrie*, Bd. 8, S. 121-154, 37 Abb. Berlin, 1918. 1918

(1) Generalities including a list of Moslem writings on hydraulic machines; (2) Various forms of hydraulic machines ; (3) Hydraulic machines after GAZARÎ, who fl. about 1200 in Dijâr Bekr on the upper Tigris, and an Arabic MS. of Oxford (n° 954). G. S.

Zwemer, Samuel Marinus. The influence of animism on Islam. An account of popular superstitions, XI + 246 p. New York, MACMILLAN, 1920 (also London, S P. C. K.). 1918

13. — ISRAEL

(See also Bible.)

Jacobs, Joseph (1854-1916). Jewish contributions to civilization. An estimate, 334 p. Philadelphia. The Jewish publication society of America. 1919. 1918

Oesterley, W. O. E. and **Box, G. H.** A short survey of the literature of rabbinical and mediæval Judaism, XII + 334 p. London, Society for the promotion of Christian knowledge, 1920. 1919

Sokolov, Nahum. History of Zionism, 1600-1918. With an introduction by the Rt. Hon. A. J. BALFOUR. 2 vol., 89 portraits and illustr. London, LONGMANS, 1919. 1918

14. — JAPAN

Dautremer, Joseph. L'empire japonais et sa vie économique. 3e éd. Paris, CHALLAMEL, 1919, 1918

Morse, Edward Sylvester. Japan day by day (1877-1883) with 777 illustr. from sketches in the author's diary, 2 vol. Boston, HOUGHTON, 1917. 1818

15. — MIDDLE AGES

Endres, Jos. Anton. Forschungen zur Geschichte der frühmittelalterlichen Philosophie (*Beitr. zur Gesch. d. Philos. des Mittelalters*, 17. Bd., H. 2 u. 3.) Münster i. W., 1915. 1818

Hauber, A. Planetenkinderbilder und Sternbilder. Zur Geschichte des menschlichen Glaubens und Irrens. Mit 51 grossenteils Ulmer Hdsch. entnommenen Abbildungen auf 36 Tafeln. (*Studien zur deutschen Kunstgeschichte*, 194. H.), XVI + 290 p. Strassburg, HEITZ, 1916. 1818

Hellmann, G. Die Wettervorhersage im ausgehenden Mittelalter (XII bis XV Jahrhundert). *Beitr. zur Gesch. d. Meteorologie*, Nr. 8, t. II, 169-229. Berlin, 1917. 1818

Divided into 3 parts : (I) *Introductions to weather-forecasting by Western writers*. HELLMANN deals chiefly with the following : XIIth cent., JOHANNES HISPALENSIS ; XIIIth, ROBERT GROSSETESTE, LEOPOLD OF Austria, GUIDO BONATTI ; XIVth, ROBERT OF YORK, RICHARD OF WALLINGFORD, WILLIAM MERLE, JOHN ASHENDEN, FIRMIN DE BEAUVAL ; XVth, REGIOMONTANUS, STÖFFLER. — (II) *Sources of these introductions*. Short notices on the writers, mostly Arabic or Jewish, upon whose works mediæval theories were based. — (III). *The practice of weather-forecasting*. J. DE BLANCHIS, 1481 ; M. SCRIBANARIUS, 1482; J. ENGEL, 1497. Check-list of incunabula « Prognostics ». 264 in all by 64 authors (32 Italians, 23 Germans and Austrians, 3 Dutchmen). The oldest is by FRANCISCUS DE GUASCONO of Venise, 1470 (earliest copy extant, 1474). G. S.

Hoops, Johannes (*editor*). Reallexikon der germanischen Altertumskunde. Unter Mitwirkung zahlreicher Fachgelehrten. 4 Bde. Strassburg, TRÜBNER, 1911-1919. 1818

A mediæval encyclopedia of fundamental value, including 2023 articles contributed by 84 scholars. It is complete. but a fifth volume containing addenda and a general index is being prepared. Among the contributors we note *ex. gr.* the late BJÖRNBO, FRANZ BOLL, KARL SUDHOFF, PAUL VINOGRADOFF. G. S.

Maunder, A. S. D. The date and place of writing of the Slavonic Book of ENOCH. *The Observatory*, vol. 41, p. 309-316, 1918. 1818

The book includes a description of the ten heavens and an account of the Christian ecclesiastical calendar. It is not as old as the eleventh century. J. L. E. D.

O'Brien, George. An essay on mediæval economic teaching. London, LONGMANS, 1920. 1818

Renard, Georges. Guilds in the Middle Ages. Transl. by DOROTHY TERRY and ed. with an introduction by G. D. H. COLE, XXV + 140 p. London, BELL, 1919. 1818

Schöffler, Herbert. Beiträge zur mittelenglischen Medizinliteratur, XV + 308 p. Halle a. S., NIEMEYER, 1919. 1818

Singer, Dorothea Waley. Survey of medical manuscripts in the British Isles dating from before the sixteenth century. *Proceedings of the R. Soc of Med.*, 1919, vol. XIII, p. 96-107. London. 1818

Completes the note published in *Isis*, t. III, p. 271-274, giving the description of 34 typical medical MSS. and statistical information. The catalogue refers to some 30.000 MSS. (counting all duplicates) of which half are medical or quasi-medical. There survive in the British Isles some 1900 texts on general medicine, 225 on anatomy; 194 on surgery; 42 on the pulse, 274 on uroscopy, 63 on the eye; 10 on diagnosis by blood inspection; 600 on herbals and simples; 2500 on recipes; 669 bestiaries; 600 magical texts and charms; 953 on alchemy; 183 lapidaries; 114 on physiognomy and cheiromancy; 41 on melothesia; 624 on the four complexions; 234 on phlebotomy; 168 on fevers; 144 on diet; 90 on pestilence; 176 on gynæcology; 106 on fermentation and generation; 72 on regimen and health of children; 214 on other regimens; 220 on hospitals. The chronological distribution is as follows (the Roman numerals designate centuries, the Arabic, numbers of MSS.): VIII, 6; IX, 19; X, 38; XI, 98; XII, 175; XIII, 1058; XIV, 2251; XV, 4931. G. S.

Singer, Dorothea Waley. Hand-list of scientific MSS. in the British Isles dating from before the sixteenth century, 12 p. London, ALEX. MORING Ltd. 1919. 1819

A plea for the study of mediæval science and an outline of the work undertaken by the author; see a similar outline in *Isis*, t. III, p. 271-274, 1920. G. S.

Sudhoff, Karl. Beiträge zur Geschichte der Chirurgie im Mittelalter. Graphische und textliche Untersuchungen in mittelalterlichen Handschriften (*Studien zur Geschichte der Medizin*, Heft 10, 11, 12). Erster Teil, X + 224 p., 65 pl., 1914; XXXVI + 685 p., 29 pl., 1918. Leipzig, BARTH. 1818

It is not the editor's fault if this monumental publication has not yet been reviewed in *Isis*. However because of its very importance, it will be enough for the present to mention it and to say that no one can henceforth undertake to study medieval surgery (or medicine) without reference to it. It is an amazing collection of original texts and illustrations; we cannot look it over without feeling deeply grateful to the great old man who gave it to us. This wealth of new material would make it necessary to rewrite the medieval section of GURLT's history (1898). The documents are classified as follows: (1) Operationsbilder; (2) Lehr- und Merkschemata für die Beurteilung der Schwere von Verletzungen, Kauterienanwendung, Schröpfen und Aderlass; (vol. 2): (3) Abbildungen von Instrumenten; (4) Lateinische chirurgische Texte des Mittelalters aus Italien und Südfrankreich; (5) Chirurgische Texte aus Deutschland, grössenteils in deutscher Sprache, Verzeichnis der benutzten Hdsch. Namen, Sach und Wortregister. G. S.

Turberville, Arthur Stanley. Mediæval heresy and the inquisition, VII + 264 p. London, CROSBY, 1920. 1818

Wedel, Theodore Otto. The mediæval attitude toward astrology, particularly in England. (*Yale studies in English*, LX), 168 p. New Haven, YALE University Press, 1920. 1818

The author's original purpose was to interpret references to astrology in mediæval English literature, but he was irresistibly led to extend his field of research and to trace the development of astrology from AUGUSTINE to the XVth cent. His work is subdivided as follows : (1) Ancient astrology (chiefly based on BOUCHÉ-LECLERQ) ; (2 Astrology in the early mediæval centuries ; (3) Astrology in old English literature ; (4) Arabian astrology ; (5) Mediæval acceptance of astrology ; (6) Astrologers in mediæval England ; (7) Astrology in the mediæval romances ; (8) Astrology in middle English literature ; (9) Astrology in GOWER and CHAUCER Bibliography and Index The author seems to have covered the ground thoroughly. It is a pity however that he did not know FR. BOLL'S excellent little book *Sternglaube u. Sterndeutung*. Leipzig, 1919 (cfr. *Isis*, t. III, p. 482).

G. S.

Wells, John Edwin. A manual of the writings in Middle English, 1050-1400, XV + 941 p. New Haven, YALE University Press. 1916 ; First supplement, Additions and modifications to September 1918, p. 947-1037. 1919. 1818

Williams, Mary Wilhelmine. Social Scandinavia in the Viking age, XIV + 451 p. New York, MACMILLAN, 1920. 1818

16. — ROME

Besnier, Maurice. L'interdiction du travail des mines en Italie sous la République. *Revue archéologique*, t. X, p 31-50. Paris, 1919. 1818

Apropos of the legal obstacles to the mining industry, dating chiefly of the second century B. C. which were due to the deep aversion of the Romans to mining. G. S.

Cagnat, René et **Chapot, V.** Manuel d'archéologie romaine, t. I. Les monuments. Décoration des monuments. Sculpture, XXVI + 735 p., 371 fig. Paris, PICARD, 1916. 1818

Il suffira d'indiquer la table des matières de cette excellente encyclopédie, fruit d'une très longue expérience — I. Les monuments : (1) Matériaux de construction ; (2) Utilisation des différents matériaux pour la construction et la décoration des édifices ; (3) Routes, ponts et ports ; (4) Villes, murailles et portes ; (5) Citernes, acqueducs, fontaines et égouts ; (6) Forum et ses monuments ; (7) Monuments religieux ; (8) Salles de spectacle ; (9) Etablissements de bains ; (10) Marchés, greniers, magasins, celliers ; (11) Salles de réunion, bibliothèques ; (12) Camps et défences de frontières ; (13) Monuments honorifiques ; (14) Maisons de ville ; (15) Exploitations agricoles, maisons de campagne ; (16) Monuments funéraires. — II. Décoration des monuments : Première partie. La Sculpture : (1) Généralités, technique ; (2) Divinités ; (3) Portrait. Empereurs et impératrices ; (4) Portrait. Les particuliers ; (5) Sujets de genre en ronde bosse ; (6) Reliefs décoratifs ; (7) Bas-reliefs à sujets religieux ; (8) Reliefs funéraires ; (9) Reliefs à sujets historiques et militaires ; (10) Bas-reliefs à sujets de genre ; (11) Sujets de lampe ; (12) Reliefs de stuc ; (13) Reliefs de céramique peinte. G. S.

Gummerus, Herman. Die römische Industrie. Wirtschaftsgeschichtliche Untersuchungen. I. Das Goldschmied- und Juweliergewerbe. *Klio*, t. XIV, p. 129-189. Leipzig, 1914 ; t XV, p. 256-302, 1918.

1818

Mentz, Arthur. Beiträge zur Geschichte der römischen Stenographie. *Hermes*, 51. Bd., p. 189-210. Berlin, 1916. 1818

(I) ISIDOR und die römische Stenographie ; (II) Die christlichen Bestandteile der Commentarii Notarum Tironianarum ; (III) Die erdkundlichen Namen in den Commentarii Notarum Tironianarum III, 1 ; (IV) Die Anlage von SENECAS Verzeichnis Tironischer Noten. G. S.

Miller, Konrad. Itineraria Romana. Römische Reisewege an der Hand der Tabula Peutingeriana dargestellt, LXXV + 960 col. + 961-992 p., 317 illustr. Stuttgart, STRECKER, 1916. 1818

Mooney, William West. Travel among the ancient Romans, 178 p., 26 illustr., 5 maps. Boston, BADGER, [1920]. 1818

Miscellaneous. Travel on land. Travel on water. Lodging. — A semi-popular account based partly on the sources, partly on other manuals. The author does not profess to present anything new on the subject, but his account is clear and gives one a vivid idea of Roman travel. G. S.

Oswald, Felix and Pryce, T. Davies. An introduction to the study of Terra Sigillata, treated from a chronological standpoint. XII + 286 p., 85 pl. London, LONGMANS, 1920. 1818

Sandys, Sir John Edwin. Latin epigraphy. An introduction to the study of Latin inscriptions, XXIV + 324 p. Cambridge University Press, 1919. 1818

PART III.

Systematic classification.

Containing only the materials wich could not be included in the two previous parts : centurial and historical. The topics are classified in alphabetic order.

2. — ANTHROPOLOGY (human and comparative)

Boule, Marcellin. Les hommes fossiles. Eléments de paléontologie humaine, 492 p., 239 fig. Paris. MASSON, 1921. 1818

Voir L. JOLEAUD, *Revue générale des sciences*, t. 32, p. 69-74, 1921.

Hrdlicka, Ales. The Races of Russia (with 1 map). Smithsonian Miscellaneous collections, vol. 69, no. 11, 21 p. Washington, 1919. 1818

Russia is eminently a Slav country. The same can be said of Siberia and in large measure even of the Caucasus. In Central Asia the Russian element is still considerably exceeded by the Turco-Tartars. The Russian Slavs count to day over one hundred millions and they are increasing yearly by 1,700,000. G. S.

Keane, Augustus Henry (1833-1912). Man. Past and Present. Revised and largely rewritten by A. HINGSTON QUIGGIN and A. C. HADDON, XI + 582 p., 16 pl. Cambridge University Press, 1920 [1st ed., 1899]. 1818

3. — ARCHÆOLOGY (museums and collections)

British Museum. How to observe in archæology. Suggestions for travellers in the Near East and Middle East, 103 p. London, 1920. 1818

Dottin, Georges (Prof. univ. Rennes). Manuel pour servir à l'étude de l'antiquité celtique, 2e ed. revue et augmentée, XVI + 524 p. Paris, CHAMPION, 1915. 1818

Le plan et la méthode de cet ouvrage excellent sont les mêmes que ceux de la 1re éd. de 1906. Il est bon de dire que le livre de DOTTIN ne fait aucunement double emploi avec le Manuel du regretté DÉCHELETTE. En voici le plan : (1) Sources et méthode ; (2) Langue ; (3) Personnes et coutumes ; (4) Etat ; (5) Religion ; (6) Bardes, vatès, druides ; (7) Empire celtique. Index très copieux. G. S.

Holmes, William Henry. Handbook of aboriginal American antiquities. Part I. Introductory. The lithic industries. (*Bureau of American ethnology*, Bull. 60), XVII + 380 p., 223 fig. Washington, Government printing office, 1919. 1818

The first 154 pages deal with generalities, the rest with the lithic industries. Among the problems dealt with in the introduction, I would quote : race and culture origins, intercontinental communication, migration, culture development and mutation, chronology, characterization areas, classification of antiquities. Let us hope that HOLMES will be able to complete rapidly this precious encyclopædia. G. S.

Joyce, Thomas Athol. Mexican archæology, an introduction to the archæology of the Mexican and Mayan civilizations of pre-Spanish America. New York. PUTNAM, 1914. 1818

Joyce, Thomas Athol. Central American and West Indian archæology; an introduction to the archæology of the states of Nicaragua, Costa Rica, Panama and the West Indies. New York, PUTNAM, 1916. 1818

4. — ART. ART AND SCIENCE. ICONOGRAPHY

Combarieu, Jules. Histoire de la musique des origines au début du XXe siècle, 3 vol. Paris, COLIN, 1913-1919. 1818

Filow, Bogdan D. Early Bulgarian art, VIII + 86 p., 58 pl,, 72 ill. Berne, HAUPT, 1919. 1818

Richter, Gisela M. A. Catalogue of engraved gems of the classical style, LXXIV + 232 p. New York, Metropolitan Musuem, 1920. 1818

Strzygowski, Josef. Altai-Iran und Völkerwanderung. Ziergeschichtliche Untersuchungen über den Eintritt der Wander- und Nordvölker in die Triebhäuser geistigen Lebens. Anknüpfend an einen Schatzfund in Albanien. Mit 229 Abb. und 10 Lichtdrucktafeln, 4°, XII + 319 S. Leipzig, HINRICHS, 1917. 1818

This study of Medieval art utilizes a material of bewildering complexity, largely Oriental. It originated in the study of the Albanian treasure found in 1902, the greatest part of which was bought by the late J. PIERPONT MORGAN and is now in New York. (cfr. *Isis*, t. IV, p. 174.) G. S.

6. — ASTRONOMY, GEODESY, METEOROLOGY AND TERRESTRIAL PHYSICS

Ambronn, L. Beiträge zur Geschichte der Feinmechanik. *Beiträge zur Gesch. d. Technik und Industrie*, Bd. 9, S. 1-40, 29 Abb. Berlin, 1919. 1818

A history of astronomical instruments with bibliography. G. S.

Berget, Alphonse. Où en est la météorologie? 302. Paris, GAUTHIER-VILLARS, 1920. 1818

Frank, Josef. Zur Geschichte des Astrolabs. (Habilitationsschrift, Auszug), 33 p. Erlangen, 1920. 1818

This is only an extract of a more elaborate work on the Astrolabe to appear later. The author describes briefly this instrument and some of his less known varieties and explains the construction and applications of the latter. These explanations are derived chiefly from a book of AL BIRÛNI, as translated by E. WIEDEMANN. We look forward to the publication of FRANK's complete work on the Astrolabe. G. S.

Hellmann, G. Beiträge zur Geschichte der Meteorologie, Nr. 1-5. (*Veröff des kgl. preuss. meteor. Instituts*, Nr. 273) 4° 148 S. Berlin, BEHREND, 1914. *Idem*, 2. Band, Nr. 6-10 (*Ibidem*, Nr. 296) VI+340 S. mit 3 Tafeln u. 1 Tab. Berlin, 1917. 1818

The contents of these two volumes are analyzed in the present tenth critical bibliography, the title and analysis of each essay being placed where it belongs. G. S.

Hellmann, G. Die theologisch-meteorologische Literatur. *Beitr. zur Gesch. d. Meteorologie*, Nr. 4, p. 113-138. Berlin, 1914. 1818

Elaborate description of a selected collection of theological books dealing mainly with meteorological facts. They are classified in 3 groups: (I) *Sermons* apropos of floods, storms, etc. As every catastrophe was the occasion of many such sermons, only a relatively small number could be quoted. They date from 1562 to 1911; (II) *Theol.-meteorol. treatises*, wherein meteorological facts are treated more systematically and at greater length. The oldest quoted is one by A. MOIBANUS, 1536 with a preface by LUTHER. It contains a description of a storm in Oels, Silesia, Sept. 1, 1535. Many of the later treatises were inspired by WILLIAM DERHAM's Physico-Theology, 1713. The latest exhibit is dated 1752; (III) *Prayerbooks* for special use during storms, etc.: *a*) *evangelical*, from 1607 to c. 1800; *b*) *catholic*, from 1667 to 1902. — Many of the earliest of these books are important from the historico-meteorol. point of view, because of the descriptions they contain. G. S.

Hellmann, G. Entwicklungsgeschichte des meteorologischen Lehrbuches. *Beitr. zur. Gesch. d. Meteor.* Nr. 6, t. II, p. 3-133, Berlin, 1917. 1818

A critical bibliography divided in two parts: (I) ARISTOTLE's meteorology. A critical list of printed editions, translations and commentaries from 1474 to 1901 including 37 incunabula, 98 XVIth, 26 XVIIth, 3 XVIIIth and 9 XIXth cent. items. FOBES' critical edition (1919) could of course not be included

(see *Isis*, t. III, p. 278); (II) A critical list of meteorological textbooks from 1500 to 1914, with an introductory commentary. It mentions : 1 incun., 56 XVIth, 61 XVIIth, 35 XVIIIth cent. items ; 79 published in the first half of last century and 346 in the period 1851-1914. G. S.

Hellmann, G. Die ältesten Untersuchungen über Windhosen. *Beitr. zur Gesch. d. Meteorologie*, t. II, p. 329-334. Berlin, 1917. 1818

There are many references to water- and windspouts in ancient literature, but the oldest general descriptions date of the XVIth cent. : OLAUS MAGNUS in his *Historia de gentibus septentrionalibus*, Romae 1558 and LUIS DE CAMÕES in the *Lusiadas*, V, 18-23. The first scientific observations were made by the R. P. FRANÇOIS LAMY, (1636-1711) of the congregation of SAINT MAUR in 1680 (colonne de nuë) and publ. anonymously in 1689 ; later observations were made by G. MONTANARI of Padova, 1686, and publ. posthumously in 1694 First representation of a « twister », in *Journal des Voyages de Monconys*, 1665. First map of « the passage of a hurricane » by R. BUDGEN, London 1730. G. S.

Kempf, Nikolaus. Die Entwicklung der Theorien über den Höhenrauch. *Archiv für Gesch. d. Naturw.*, t. 7, p. 141 162 (*Schluss*). Bibliographie, 1552-1912. 1818

Moreux, Th. (*abbé*). Où en est l'astronomie?, 293 p., 62 fig. Paris. GAUTHIER-VILLARS, 1921. 1818

8. — BIOLOGY

Chun, Carl (1852-1914) und **Johannsen, W.** (*editors*). Allgemeine Biologie (*Die Kultur der Gegenwart*, 3. Teil, 4. Abteilung, 1. Bd.), XII + 691 p., 115 fig. Leipzig, TEUBNER, 1915. 1818

The historical introduction, from LINNÉ to DARWIN, is contributed by EM. RADL (29 p.). G. S.

East, E.M. and **Jones, D. F.** Inbreeding and outbreeding Their genetic and sociological significance (*Monographs on experimental biology*) 285 p. Philadelphia, LIPPINCOTT, 1919. 1818

Janet, Charles. Considérations sur l'être vivant. Première partie : Résumé préliminaire de la constitution de l'orthobionte, 80 p., 1 pl. Beauvais, A. DUMONTIER, 1920. 1818

Lillie, Frank Rattray. Problems of fertilization, XII + 278 p. Chicago, University Press, 1919. 1818

Mac Farlane, John Muirhead. The causes and course of organic evolution A study in bioenergetics, 875 p. New York, MACMILLAN, 1918. 1818

MacLeod, Julius (1857-). The quantitative method in biology, XII + 228 p. (Public. of the University of Manchester). London, LONGMANS, 1919. 1818

Matisse, Georges. Action de la chaleur et du froid sur l'activité des êtres vivants, 556 p. Paris, LAROSE, 1919. 1918

Haeckel, Ernst (1834-1919). Fünfzig Jahre Stammesgeschichte. Historischkritische Studien über die Resultate der Phylogenie, 70 p. Jena, FISCHER, 1916. 1918

Nägler, Kurt. Am Urquell des Lebens. Die Entdeckung der einzelligen Lebewesen von LEEUWENHOEK bis EHRENBERG, 116 p., 38 fig. (*Voigtländers Quellenbücher*). Leipzig, 1918 (?). 1918

9. — BOTANY

(Agronomy, Phytopathology, Palæobotany.)

Béguinot, Augusto La Botanica. Guide « ICS », Profili bibliografici de « L'Italia che scrive », 116 p. Roma, Istituto per la propaganda della cultura italiana, 1920. [3 L. 50] 1918

As in the previous guide of the same collection, devoted to Geography (*Isis*, t. III, p. 360), the bibliography proper is preceded by an introductory text (43 p.) which offers a short synthesis of Italian efforts in botany. The introduction is subdivided as follows : (I) History from 1801 to 1870. — (II) Schools and tendencies since 1870. — (III) History since 1870 : (1) anat., physiol. and biology ; (2) systemat. bot., monographs ; (3) floristics, cryptogamy ; (4) phytogeography, origin of floras ; (5) origin of species, evolution ; (6) applied bot. ; (7) histor. and bibliogr. studies. — (IV) Organization of bot., collective undertakings. — Excellent compendium.

G. S.

Maurizio, Adam. Die Getreidenahrung im Wandel der Zeiten, 257 p., 53 illustr. Zürich, FÜSSLI, 1916. 1918

10. — CHEMISTRY, PHYSICO-CHEMISTRY

Gunther, R. T. Early Science in Oxford. Part I. Chemistry, VI + 91 p. Oxford Science Laboratories, 1920. 1918

Title quoted from Sir EDWARD THORPE's elaborate review in *Nature*, vol. 107, p. 13-15, 1921. G. S.

Herz, Walter G. Grundzüge der Geschichte der Chemie. Richtlinien einer Entwicklungsgeschichte der allgemeinen Ansichten in der Chemie, 142 p. Stuttgart, ENKE, 1916. 1918

Meyer, Ernst von (1847-1916). Geschichte der Chemie von den ältesten Zeiten bis zur Gegenwart. Zugleich Einführung in das Studium der Chemie. 4te verbesserte und vermehrte Auflage, XIV + 616 p. Leipzig, VEIT, 1914. 1918

The first ed. of this capital textbook appeared in 1889, the third in 1905 (end of 1904) ; the English transl. by GEORGE MCGOWAN, London, MACMILLAN appeared first in 1891 ; second and third ed. following closely the second and third German ed., appeared in 1898 and 1906. — In this fourth ed. the author has availed himself of the results of the investigations carried on by LIPPMANN, GUARESCHI, WIEDEMANN, KAHLBAUM, STRUNZ, etc. He was not able to use LOEWENFELD's Contributions, Manchester 1913. G. S.

Moore, F. Jewett. A history of chemistry, XIV + 292 p., illustr. New York. McGRAW-HILL, 1918. 1818

Outgrowth of a series of talks which the author has for several years given to his students at the Massachusetts Institute of Technology. Many portraits and illustrations ; short bibliogr. notes at the end of each chapter.
G. S.

Ostwald, Wilhelm. Die chemische Literatur und die Organisation der Wissenschaft, IV + 120 p. Leipzig, FOCK, 1919. 1818

11. — ECONOMICS

(Economic doctrines and theories, Commerce, Transportation and Communications.)

Bellet, Daniel (1864-1917). L'évolution de l'industrie, 346 p. Paris, FLAMMARION, 1914. 1818

Chapin, Francis Stuart. A historical introduction to social economy, XI + 316 p. New York, CENTURY, 1917. 1818

12. — EDUCATION

(Methods, Colleges, Universities.)

Bologna. L'Università di Bologna nel passato e nel presente. A cura di un comitato di professori della stessa università, XVI + 198 p., ill. Bologna, ZANICHELLI, 1919. 1818

Kenyon, Frederic George Education Secondary and University. A report of conferences between the Council for Humanistic Studies and the Conjoint Board of Scientific Societies, 47 p. London, MURRAY, 1919. 1818

13. — ETHNOLOGY

(Primitive and popular science.)

Bellucci, Giuseppe. I chiodi nell' etnografia antica e contemporanea. 266 p., 64 ill. Perugia, Un. tipog. coop., 1919. 1818

Cope, Leona. Calendars of the Indian North of Mexico. *Publications in American archæology and ethnology*, vol. 16, p. 119-176. Berkeley, University of California Press, 1919. 1818

Cushing, Frank Hamilton. Zuñi breadstuff. (Indian notes and monographs, vol. VIII), 674 p., illustr. New York, Museum of the American Indian, 1920. 1818

The author (b. in Northeast, Pennsylvania 1857, d. 1900) a born ethnologist and a man of genius, lived as an adopted member of the Zuñi tribe from 1879 to 1884, indeed he became second chief of the tribe, the Head Priest of the Bow, wearing native costume, eating native food and participating in all native occupations and pastimes. The studies here reprinted from *The Millstone* of Indianapolis, 1884-1885 (an extinct trade magazine), are thus of considerable importance. Biographical notes by Major JAMES JOHN WESLEY POWELL are reprinted in the Foreword from the *21st. Annual Report of the Bureau of American Ethnology*.
G. S.

Gilmore, Melvin R. Uses of plants by the Indians of the Missouri river region. *Thirty-third annual report of the Bureau of American ethnology*, p. 43-154, 33 pl. 1919. 1919

Quoted from O. A. Stevens' elaborate review in *Science*, vol. 52, p. 99-101, 1920. G. S.

Hahn, Eduard. Von der Hacke zum Pflug (*Wissenschaft und Bildung*, 127). 114 S. Leipzig, Quelle und Meyer, 1914. 1919

A popular account of a great subject — the origins of husbandry — by a master who has devoted twenty five years of his life to it. Hahn's theory is entirely opposed to the old (*i. e.* xviiith cent.) theory of the three stages of culture: the hunter, the shepherd, the husbandman. This theory was accepted because of an undervaluation of woman's activities, specialized from the beginning in husbandry. Hahn also insists upon the religious origins of agriculture: while the material labour was being done by woman, it was man's business to attend to the magical side. G. S.

Lowie, Robert H. Primitive society, viii + 463 p. New York, Boni and Liveright, 1920. 1919

Marett, R. R. Psychology and Folk-lore. ix + 275 p. London, Methuen, 1920. 1919

Routledge, Mrs. Scoresby. The mystery of Easter island. The story of an expedition, xxi + 404 p. London, printed for the author by Hazell, [1919]. 1919

Smith, Grafton Elliot. The evolution of the dragon, xx + 234 p. Manchester, University Press, 1919. 1919

Stübe, R. Zur Ursprungsgeschichte der alkoholischen Getränke. *Beitr. zur Gesch. d. Technik u. Industrie*, t. VIII, p. 56-63. Berlin, 1918. 1919

14. — GEOGRAPHY

Günther, Siegmund. Das Zeitalter der Entdeckungen. Vierte Auflage, 106 p. (*Aus Natur und Geisteswelt*, 26). Leipzig, Teubner, 1919. 1919

This fourth ed. of Günther's well known history of geographical discoveries has been brought up-to-date, at least as far as German publications are concerned. This being a popular account, there are no footnotes but only a short bibliography at the end. (I) Antiquity and Middle Ages (p. 5-20); (II) The Portuguese in Africa and India (p. 20-38); (III) Columbus and the discovery of the New World (p. 39-52); (IV) The first circumnavigation and the exploration of the Pacific Ocean (p. 52-62); (V) Discoveries and conquests of the Spaniards and Portuguese in America (p. 62-86); (VI) Exploration by the French and the Germans. Short index. G. S.

Langenmeier, Theodor. Lexikon zur alten Geographie des süd-östlichen Aequatorialafrika, vii + 100 p., 50 ill. (*Abh. des Hamburgischen Kolonialinstituts*, t. XXXIX). Hamburg, Friederichsen, 1918. 1919

Sheppard, T. The evolution of topographical and geological maps. *British Association for the Advancement of Science, Cardiff meeting, 1920.* Reprint, 14 p. 1818

Deals only with English maps, but contains much first-hand information. The author has compiled a still unpublished *Catalogue of British Geological Maps*, at the request of the Geological Society of London. — He is specially interested in the old county maps and road books. The study of the old « soil » maps and surveys leads him then naturally to that of the geological maps, especially those of « Strata » SMITH. G. S.

Wolkenhauer, W. Deutschland im Kartenbilde. Uebersicht der ältesten und einer Auswahl neuerer und neuesten Karten von (Gesamt-) Deutschland. *Deutsche Geographische Blätter*, t. XXXIX, p. 19-32. Bremen, 1919. 1818

The oldest maps of Germany is the Ebstorf map of c. 1290. Then follow : 1491, NIC. OF CUSA ; 1492, ERHARD ETZLAUB ; 1493, HIER. MÜNZER ; c. 1500. G. A. VAVASSOR, etc. This list of maps with critical notes is subdivided in 5 parts : *a*) the oldest maps to MERCATOR, 1585 ; *b*) from MERCATOR to HOMANN (1589-1700) ; *c*) since HOMANN (1705-1805) ; *d*) the newer maps since REYMANN (1805-1871) ; *e*) the maps of the new German empire (1874-1916). — This paper is dedicated by the author to the memory of his son AUGUST, who had begun himself a study of the same subject and died on the battlefield in France on Febr. 25, 1915. G. S.

15. — GEOLOGY, MINERALOGY, PALÆONTOLOGY, MINING

(for palæobotany and palæozoology see respectively botany and zoology).

Crivelli, Epaminonda. Le vicende dei nomi dei metalli. *Archivio di storia della scienza*, t. II, p. 1-45. Roma, 1921. 1818

Generalities, Iron, Tin, Copper, Gold, Silver, Platinum, Lead, Antimony. An elaborate study of the metals known in ancient times, introduced by the startling statement : « La metallurgia si presenta completa all' alba dei tempi storici ». G. S.

Maedge, Carl Max. Ursprung der ersten Metalle, der See- und Sumpferzverhüttung, der Bergwerkindustrie und ihrer ältesten Organisation in Schweden. Eine prähistorisch- und historischökonomische Abhandlung. XIII + 166 p. Jena, FISCHER, 1916. 1818

Merriam, John C. The beginnings of human history read from the geological record : the emergence of man. *Scientific monthly*, vol. X, p. 321-442, 425-437, illustr. New York, 1920. 1818

Part two. Geological history of man. Delivered before the National Academy of Sciences in April 1910, as the sixth series of lectures on the WILLIAM ELLERY HALE Foundation. G. S.

Meunier, Stanislas. Les glaciers et les montagnes. (*Bibliothèque de philosophie scientifique*), 262 p. Paris, FLAMMARION, 1920. 1818

Perrier, Edmond. La terre avant l'histoire. (Les origines de la vie et de l'homme) XXIII + 415 p. (200 × 140). Paris, La Renaissance du Livre, 1920. [15 fr.] 1818

Premier volume d'une vaste collection de synthèse historique « L'Evolution de l'humanité » dirigée par HENRI BERR, et qui ne doit pas comprendre moins de cent volumes. — Le présent travail est divisé en trois parties : la formation de la terre ; les formes primitives de la vie ; vers la forme humaine. — Bibliographie non seulement très pauvre, mais unilatérale.
L. G.

Sapper, Karl. Katalog der geschichtlichen Vulkanausbrücke. (*Schriften der wissensch. Ges. in Strassburg*), 27. Heft, XI + 358 p. Strassburg, TRÜBNER, 1917. 1818

A publication of fundamental importance made from the point of view of the geologist rather than of the historian. Therefore the general order is geographical, not chronological. Yet to the historian too, this very carefully compiled list will be very useful. It is followed by a series of notes and statistics of general vulcanological interest. G. S.

Treptow, E. Der älteste Bergbau und seine Hilfsmittel. *Beitr. zur Gesch. d. Technik u. Industrie*, Bd. 8, S. 155-191, 50 Abb. Berlin, 1918. 1818

History of mining in prehistoric and ancient times, also by primitive people and in the Far East. Very elaborate and interesting. G. S.

Wichmann, Arthur. Die Erdbeben des indischen Archipels bis zum Jahre 1857. *Verhandelingen der Kon. Akad van Wetenschappen te Amsterdam*, 2de sectie, deel XX, n° 4, 193 blz. Amsterdam, 1918. 1818

A catalogue of earthquakes in the East Indies from 88 A. D. to 1857, with indications of the sources of reference. The dates are given whenever possible both in Christian and Javanese style. For ex. the first date is 88 A. D. = Çaka 10. Then follow : 134, 296, 416, 444, 1192, 1200, 1242, 1254, 1282, 1296 ; 7 in the XIVth cent., 6 in the XVth, 12 in the XVIth, etc. G. S.

16. — HISTORY OF CIVILIZATION

General history. Historical methods. Biography and Chronology.

Abbott, Wilbur Cortez (*Prof.* HARVARD). The expansion of Europe. A history of the foundations of the modern world, 2 vol. New York, HOLT, 1918. 1818

Bury, John Bagnell. The idea of progress. An inquiry into its origin and growth, XV + 377 p. London, MACMILLAN, 1920. 1818

Cotterill, H. B. Italy from DANTE to TASSO (1300-1600). Its political history as viewed from the standpoints of the chief cities with descriptions of important episodes and personalities and of the art and literature of the three centuries, XXVIII + 617 p., with many maps and illustrations. London, HARRAP, 1919. 1818

A useful summary, century by century of Italian life, letters, art ; followed by a series of lists and genealogical tables. G. S.

Gilfillan, S. C. The coldward course of progress. *Political science quarterly*, t. XXXV, p. 393-410, New York, 1920. 1818

The thesis of the author is that civilization has tended to move « coldward » while advancing and « warmward » when declining. G. S.

Harnack, Adolf von. Ueber die Sicherkeit und die Grenzen geschichtlicher Erkenntnis. Vortrag. 23 p. München, OLDENBURG, 1917. 1818

Huntington, Ellsworth. World power and evolution, 287 p. New Haven, Yale University Press, 1919. 1818

Macdonald, George. The evolution of coinage, VIII + 148 p., 8 pl. Cambridge University Press, 1916. 1818

Petrie, W. M. Flinders. Some sources of human history, 128 p., illustr. London, Society for the promotion of Christian Knowledge, 1919. 1818

Wells, Herbert George (1866-). The outline of history. Being a plain history of life and mankind, 2 vol., illustr. London, NEWNES, 1920. 1818

A very useful undertaking, similar to that attempted previously by ELISÉE RECLUS and others. Such books have done more to diffuse knowledge and understanding of the past than all the universities of the world. One cannot be to thankful to their authors. G. S.

17. — LANGUAGE AND LITERATURE

Boas, F. (*and others*). Phonetic transcription of Indian languages. Report of Committee of American anthropological association. Smithsonian miscellaneous collections, vol. 66, no 6, 15 p., 1 table. Washington, 1916. 1818

Results of a cooperative study of the subject by F. BOAS, P. E. GODDARD, E. SAPIR, A. L. KROEBER. Interesting also for those concerned with the general problem of transliteration or any one of its applications. A table reproduces the classification of 36 vowels based on H. SWEET. G. S.

Jespersen, Otto. The classification of languages A contribution to the history of linguistic science. *Scientia*, t. XXVIII, p. 109-120, Bologna, 1920. 1818

Traces the history of the morphological classification of languages into three groups : isolating, agglutinating and flexional languages. FRIED. V. SCHLEGEL, 1808 ; A. W. V. SCHLEGEL, 1818 ; FRANZ BOPP, 1820 ; WILH. V. HUMBOLDT, 1822 ; A. F. POTT ; AUGUST SCHLEICHER, 1848, etc. JESPERSEN's conclusion is that the tripartition is insufficient to classify languages comprehensively, for their structural diversities are far too great. Languages seem to have evolved at all times in the same way as they do now, — from greater complication and irregularity towards greater ease and simplicity and regularity, or from chaos to cosmos. G. S.

Marouzeau, J. La linguistique ou science du langage, 190 p. Paris, GEUTHNER, 1921. [7 fr. 50] 1818

Excellente introduction à la linguistique, très claire, très sûre et très complète, écrite en une langue fort simple, sans aucun pédantisme. Chaque chapitre est précédé d'une courte bibliographie purement française. L'auteur indique successivement le but et le contenu des diverses branches de la linguistique dans l'ordre suivant : phonétique, étude du vocabulaire, morphologie, sémantique, syntaxe, stylistique, grammaire descriptive,

grammaire historique, grammaire comparée, grammaire générale, et termine par quelques indications sur les sciences auxiliaires et sur l'histoire de la linguistique. G. S.

18. — LOGIC AND THEORY OF KNOWLEDGE

Bloch, Ernst. Ueber Wirklichkeit und Wahrheit. Ein Beitrag zur entwicklungsgeschichtlichen Begründung der Erkenntnistheorie. *Annalen der Naturphilosophie*, 14 Bd., p. 54-82, Leipzig, 1919. 1818

Burali-Forti, Cesare. Logica matematica, 2a ediz. intieramente rifatta, XXXII + 483 p. Milano, HOEPLI, 1919. 1818

Lewis, Clarence Irving. A survey of symbolic logic, VI + 406 p. Berkeley, University of California Press, 1918. 1818

19. — MATHEMATICS

Ahrens, Wilhelm. Mathematische Unterhaltungen und Spiele. 2te verm. u. verbess. Auflage, 2 Bd., X + 455 p. Leipzig, TEUBNER, 1910-1918. [1st ed., 1901]. 1818

Archibald, R. C. EULER integrals and EULER's spiral, sometimes called FRESNEL integrals and the Clothoïde or CORNU's spiral. *American mathematical monthly*, t. XXV, p. 276-282, 1918. 1818

Archibald, Raymond Clare. Notes on the logarithmic spiral, golden section and the FIBONACCI series. Reprinted from JAY HAMBIDGE'S *Dynamic Symmetry*. p. 146-157. New Haven, YALE University Press, 1920. 1818

History of these three topics, with very abundant bibliographic references. For a discussion of HAMBIDGE'S work see *Isis*, t. IV, p. 32. ARCHIBALD'S notes constitute a very valuable *hors d'œuvre*, not an integral part of the book. They first appeared in the *Amer. mathem. monthly*, April and May 1918, but extensive additions and some corrections have been introduced. G. S.

Archibald, R. C. Historical note on the relation $e^{-(\pi/2)} = i^i$. *The American mathematical monthly*, t. XXVIII, p. 116-121, 1921. 1818

This note is preceded by another one by H. S. UHLER giving the values of $e^{-\pi/2}$ and of seven related powers of the same base, with more than 50 places of decimals. G. S.

Archibald, R. C. Perfect numbers. *American mathematical monthly*, vol. 28, p. 140-153, 1921. 1818

Boncompagni, Baldassarre [Roma 1821-1894] (*editor*). Bullettino di Bibliografia e di Storia delle Scienze Matematiche e Fisiche pubblicato da B. BONCOMPAGNI. Indici dei venti tomi componenti il presente Bullettino (anni 1868-1887). (Serie di indici generali di opere periodiche italiane estinte pubblicati a cura del Dott. ATTILIO NARDECCHIA, No 1), 33 cm., 52 p. Roma, NARDECCHIA, 1915. 1818

(I) Indice per articoli ; (II) Indice per nome d'autori ; (III) Indice di documenti inediti. G. S.

Hardy, G. H. Some famous problems of the theory of numbers and in particular WARING's problem. (Inaugural lecture), 35 p. Oxford, CLARENDON Press, 1920. 1818

Karpinski, Louis C. The parallel development of mathematical ideas, numerically and geometrically. *School Science and Mathematics*, vol. 20, p. 821-828, 1920. 1818

Loria, Gino. Veicoli al servizio dei calcolatori. *Scientia*, t. XXVIII, p. 77-93. Bologna, 1920. 1818

History of appliances used for computing. G. S.

Muir, Sir Thomas (1845-). The theory of determinants in the historical development, 3 vol. London, MACMILLAN, 1906-1920. 1818

Vol I, 1906, XI + 491 p., from LEIBNIZ (1693), FONTAINE (1748), etc. to 1841 ; vol. II, 1911, XVI + 475 p., the period 1841 to 1860 ; vol. III, 1920, XXVI + 503 p., the period 1861 to 1880. A fourth volume, bringing the record up to the end of the XIXth century, was nearly complete in manuscript in 1918. The author's plan is to include in it a detailed index to the whole work. Let us hope that it may soon appear. G. S.

Roscher, Wilhelm Heinrich Die Zahl 50 im Mythus, Kultur, Epos und Taktik der Hellenen und anderer Völker, besonders der Semiten. (*Abhdl. d Kgl. sächs. Gesell. d. Wiss., phil. hist. Klasse*, 33. Bd.), 134 p. Leipzig, TEUBNER, 1917. 1818

Russell, Bertrand (1872-). Introduction to mathematical philosophy. London, ALLEN [c. 1919]. 1818

Weinreich, Otto. Triskaidekadische Studien. Beiträge zur Geschichte der Zahlen (*Religionsgesch. Versuche und Vorarbeiten*, t. XVI, 1). Giessen, TÖPELMANN, 1916. 1818

20. — MECHANICS

Carmichael, Robert D. The theory of relativity. Second ed., revised and enlarged (*Mathematical monographs*, No. 12), 112 p. New York, WILEY, 1920. 1818

Carr, H. Wildon. The general principle of relativity in its philosophical and historical aspect, x + 165 p. London, MACMILLAN, 1920. 1818

Eddington, A. S. Space, time and gravitation. An outline of the general relativity theory, VII + 218 p. Cambridge, University Press, 1920. 1818

An excellent introduction to the theory of relativy. Such an immense literature has appeared lately on this subject that it would serve no useful purpose to give a complete bibliography of it in *Isis*, but I try to quote the most important publications which I know of. The reader anxious to have a general but accurate idea of the theory, should read at least EINSTEIN's popular exposition and EDDINGTON's book. G. S.

Einstein, Albert (1879-). Ueber die spezielle und die allgemeine Relativitätstheorie, gemeinverständlich. 7e Auflage. Braunschweig, VIEWEG, 1920. [1re Aufl., 1917]. 1918

Einstein, Albert. Relativity : the special and general theory. A popular exposition. Authorized translation by ROBERT W. LAWSON, XIII + 138 p. London, METHUEN, 1920. 1918

Einstein, Albert. Aether und Relativitäts-Theorie. Rede gehalten am 5 Mai 1920 an der Reichs-Universitäts zu Leiden, 15 p. Berlin, SPRINGER, 1920. 1918

Freundlich, Edwin. The foundations of EINSTEIN's theory of gravitation. Transl. by HENRY L. BROSE. Preface by ALBERT EINSTEIN. Introduction by H. H. TURNER. XVI + 61 p. Cambridge University Press, 1920. 1918

Guillaume, Edouard. Les bases de la théorie de la relativité. *Revue générale des sciences*, t. XXXI, p. 200-210. Paris, 1920. 1918

(I) La mécanique newtonienne; (II) La théorie limitée; (III) La théorie générale.

Haas, Arthur Erich Die Grundgleichungen der Mechanik dargestellt auf Grund der geschichtlichen Entwicklung, 216 S. Leipzig, VEIT, 1914. 1918

Lecornu, Léon. La mécanique. Les idées et les faits. (Bibliothèque de philosophie scientifique), 304 p. Paris, FLAMMARION, 1918. 1918

Lodge, Sir Oliver J. Inertia. *Scientific monthly*, v. 10, p. 378-387, New York, 1920. 1918

Amplified from a lecture on Ether and Matter, given before the Royal Institution of Great Britain, on Febr. 28, 1919.

Lorentz, Hendrik Antoon. The Einstein theory of relativity, a concise statement, 64 p. New York, BRENTANO, 1920. 1918

First published in the *Nieuwe Rotterdamsche Courant* of Nov. 19, 1919.

Marcolongo, Roberto Lo sviluppo della meccanica sino ai discepoli di GALILEO. *Mem. R. Acc. d. Lincei*, t. XIII, p. 89-138, 1919. 1918

Nature. Special number : Relativity. Vol. 106, no 2677, p. 781-813. London, February 17, 1921. 1918

Contains : A. EINSTEIN, a brief outline of the development of the theory; E. CUNNINGHAM, the growth of an idea; Sir FRANK DYSON, eclipse observations of May 1919; A.-C.-D. CROMMELIN, motion of Mercury's perihelion; CHARLES E. ST. JOHN, displacement of solar lines; G.-B. MATHEWS, non-Euclidean geometries; J.-H. JEANS, general physical theory of relativity; H.-A. LORENTZ, the MICHELSON-MORLEY experiment and the dimensions of moving bodies; Sir OLIVER LODGE, geometrisation of physics and its supposed basis on the MICHELSON-MORLEY experiment; H. WEYL, electricity and gravitation; A.-S. EDDINGTON, relativity of time; NORMAN CAMPBELL,

theory and experiment in relativity; DOROTHY WRINCH and HAROLD JEFFREYS, relation between geometry and relativity; H. WILDON CARR, metaphysical aspects of relativity; select bibliography, p. 811-813. G. S.

Rieppel, A. v. und Freytag, L. Beiträge zur Entwicklungsgeschichte der technischen Mechanik. *Beitr. zur Gesch. d. Technik u. Industrie*, t. VII, p. 25-40, Berlin, 1917. 1818

Summary of the development of applied mechanics, with special reference to GALILEI, EULER, NAVIER (1785-1836), CLAPEYRON (1779-1864), CASTIGLIANO (1847-1884), KARL CULMAN (1821-1881), OTTO MOHR. G. S.

Sampson, Ralph Allen. On gravitation and relativity. Being the HALLEY lecture delivered on June 12, 1920, 24 p. Oxford, CLARENDON Press, 1920. 1818

Schlick, Moritz. Space and time in contemporary physics. An introduction to the theory of relativity and gravitation. Transl. by HENRY L. BROSE. Introduction by F. A. LINDEMANN, XI + 89 p. Oxford, CLARENDON Press, 1920. 1818

Vacca, Giovanni. Sulle origini della scienza dell' elasticità. *Rend. R. Accad. d. Lincei, (fis. mat.)*, t. XXV, p. 29-37. Roma, 1916. 1818

21. — MEDICINE

A. — *History, Organization and Philosophy.*

Bilancioni, Guglielmo. La storia della Medicina. (Guide ICS, Profili bibliografici de l' « Italia che scrive »). 100 p. Roma, Istituto per la propaganda della cultura italiana, 1920. 1814

Another excellent bibliographic guide of Italian literature, this time devoted to the historical studies of medicine. The introduction is divided as follows : (1) Le condizioni degli studi di st. d. med. fra noi ; (2) Sguardo storico alle condizioni di questi studi negli atenei di Europa ; (3) I più illustri storici d. med. in Italia (biographical sketches of SALVATORE DE RENZI, 1800 1872 ; ANGELO CAMILLO DE MEIS, 1817-1891 ; FRANCESCO PUCCINOTTI, 1794-1872 ; ALFONSO CORRADI, 1833-1892 ; CESARE TARUFFI, 1821-1902) ; (4) Vicende dell' insegnamento d. st. d. med. in It. ; (5) Le società scientifiche e i congressi ; (6) Le pubblic. periodiche ; (7) La st. d. med. e i suoi rapporti con la storia in generale. The classified bibliography fills up 50 pages closely printed. A most useful book. G. S.

Boutarel, Maurice. La médecine dans notre théâtre comique depuis ses origines jusqu'au XVI^e^ siècle. « Mires, fisisciens, naurés » (*Thèse*) 144 p. Caen, LE BOYTEUX, 1918. 1818

Diepgen, Paul. Geschichte der Medizin, 3 Bde., 116 + 118 + 142 S. (*Sammlung Göschen*). Berlin, Vereinigung Wissenschaftlicher Verleger, 1913, 1914, 1919. 1818

Brief but very full summary by an expert scholar : (I) Antiquity ; (II) Middle Ages ; (III) From VESALIUS to the founding of cellular pathology by RUDOLF VIRCHOW (1858). G. S.

Heinrichs, Heinrich. Die Ueberwindung der Autorität Galens durch Denker der Renaissance (*Renaissance und Philosophie*, 12 H.). 80 p. Bonn, Hanstein, 1914. 1918

Hovorka, Oskar von (Ordinarius des nieder-österr. Kinderhauses Gugging bei Wien) Geist der Medizin. Analytische Studien über die Grundideen der Vormedizin, Urmedizin, Volksmedizin, Zaubermedizin, Berufsmedizin, VIII + 364 S. Wien, Braumüller, 1915. 1918

A general survey of our knowledge of the origins of medicine, divided into five parts : prehistoric animal and human med. ; protomed. ; popular med. ; magical med. and the principles and the spirit of professional med. — The subtitle « analytic studies » is misleading, for Hovorka's work is rather a popular synthesis of the subject. Numbers in the text refer to a list of 200 books enumerated at the end (p 356-364). G. S.

Kassel, Karl. Geschichte der Nasenheilkunde von ihren Anfängen bis zum 18. Jahrhundert. 1. Bd., 476 p. Würzburg, Kabitzsch, 1914. 1918

Kelly, Howard Atwood and **Burrage, Walter L.** American medical biographies, 1320 p. Baltimore, Norman, 1920. 1918

First publ. 1912 under the title : « Cyclopedia of Am. med. biogr. »

Kingsley, Rose G. The order of St. John of Jerusalem (past and present) 160 p. London, Skeffington, [1918]. 1918

Miles, A. The Edinburgh school of surgery before Lister, VIII + 220 p. London, Black, 1918. 1918

Moore, Norman. The history of St. Bartholomew's hospital, 2 vol. 4°, XXII + 614 p., XIV + 992 p. London, Pearson, 1918. 1918

Neuburger, Max. Entwicklung der Medizin in Oesterreich. 104 p. Wien, Fromme, 1918. 1918

Owslanny, Stanislaus. Aus der polnischen Volksmedizin (Ein Beitrag zur Volkskunde Polens). *Diss.*, Leipzig, 43 p. Posen, 1920. 1918

Polnische Mythologie. Schwangerschaft. Geburt und Wochenbett. Kindesalter. Allgemeine Heilmethoden. Spezielle Heilmethoden. Der Tod. Literaturverzeichnis. G. S.

Pagel, Julius Leopold (1851-1912). Einführung in die Geschichte der Medizin in 25 akademischen Vorlesungen. 2te Auflage, durchgesehen, teilweise umgearbeitet und auf den heutigen Stand gebracht von Karl Sudhoff, XVI + 616 p. Berlin, Karger. 1915. 1918

Pagel's Einführung first appeared in 1897 ; the new edit. prepared by Sudhoff needs no recommendation. Sudhoff has managed to introduce into the old frame a very large amount of fresh information. One may object however that some parts, are neither a history, nor a critical bibliography, but something nondescript which will satisfy neither the reader in search of information, nor the scholar trying to find new sources. It is obvious that Sudhoff would have produced a far more satisfactory history if he had been untrammelled by Pagel's Outline, — but that would have cost him considerably more time. One must take books as they are. G. S.

Pilcher, Lewis Stephen. A list of books by some of the old masters of medicine and surgery together with books on the history of medicine and on medical biography in his possession. Together with biographical and bibliographical notes and reproductions of some title pages and captions, 201 p. illustr. Brooklyn, New York, 1918. 1818

Rivers, William Halse Rivers. Mind and Medicine. Second ed., 23 p. Manchester University Press, 1920 (first publ. in *Bull. John Rylands Library*, t. V, 1919). 1818

Saintyves, P. Les origines de la médecine. Empirisme ou magie? (*Collection science et magie*, 3), 100 p. Paris, NOURRY, 1920. 1818

For the two previous works by the same author in the same collection see *Isis*, t. II, pp. 242, 478. The present volume discusses the main theories on the origin of medicine. It is divided as follows: (I) L'origine empirique; (II) La thérapeutique magique; (III) La thérapeutique sacerdotale; (IV) Empirisme et raisonnement dans la médecine mystique. His main conclusion is that there is no essential difference between primitive, mystical empiricism and modern scientific empiricism. « Il n'y a point de mentalité prélogique. La raison instinctive... est une raison qui ne s'est pas encore critiquée elle-même ou du moins à peine, mais c'est déjà la raison. Il y a une raison précritique, il n'y a point de raison alogique. »

G. S.

22. — MORALS

Murray, Gilbert (1866-). Satanism and the world order. 46 p. London, ALLEN, 1920. 1818

Raymond, George Lansing (1839-). Ethics and natural law. A reconstructive review of moral philosophy applied to the rational art of living, XXXIII + 345 p. New York, PUTNAM, 1920. 1818

23. — PHARMACY AND PHARMACOLOGY

Kremers, Edward. The history of American pharmacy. *American Druggist*, March, p. 9-13, April, p. 9-14, May, p. 13-18, with many illustrations. New York, 1920. 1818

The first paper deals with the Colonial period, the second with the War of Independence and the Reconstruction period, the third with the changes in pharmaceutical economics. Original documents, portraits, etc., are reproduced.

G. S.

Schmidt, Alfred. Die Kölner Apotheken bis zum Ende der reichstädtischen Verfassung. Vornehmlich auf Grund des von FRIEDRICH BELLINGRODT gesammelten Materials verfasst und hrg. X + 160 p., 25 pl. Bonn, HANSTEIN, 1918. 1818

24. — PHILOSOPHY. HISTORY OF PHILOSOPHY

(See also 30 D. *Science, philosophy*.)

Comte, Auguste. La méthode positive en 16 leçons, condensée par J. EMILE RIGOLAGE (JULES RIG), VIII + 333 p. Paris, VIGOT, 1917. 1818

Ceci est un résumé du résumé en quatre volumes publié antérieurement par le même auteur. Il est divisé comme suit : (1) Nature et importance de la méthode positive ; (2) Hiérarchie des sciences positives; (3) Science mathématique abstraite ; (4) Géométrie ; (5) Mécanique ; (6) Astronomie ; (7) Physique ; (8) Chimie ; (9) Biologie ; (10) Sociologie ; (11) Statique sociale ; (12) Dynamique sociale; (13) Évolution des sociétés humaines; (14) La révolution française ; (15) Ensemble de la méthode positive ; (16) Action finale propre à la méthode positive. G. S.

McCabe, Joseph Martin (1867-). A biographical dictionary of modern Rationalists, 4°, XXXII + 934 col. London, WATTS, 1920. 1818

The Rationalists collected by MCCABE in this dictionary are the men who uphold the right of reason against the authority of Church or tradition. Rationalism in this sense, is primarily a mental attitude. The dictionary covers the period beginning with the death of GIORDANO BRUNO in 1600. Of the men (and women) included, there are about 100 of the period preceding the French Revolution, and about 200 of the first half of the XIXth century, the vast majority belong to this or the last generation. The selection may appear sometimes a little capricious; yet it is interesting and useful. G. S.

Marvin, Francis Sydney (*editor*). Recent developments in European thought. Essays arranged and edited, 306 p. London, MILFORD, 1920. 1818

Moog, Willy. Philosophie. (*Wissenschaftliche Forschungsberichte*, V), X + 106 S. Gotha, PERTHES, 1921. [8 Mk.]. 1818

The aim of the collection is to give a general survey of the work done during the war in the various fields of knowledge. Previous vol. were devoted respectively to French, Latin, German and Greek philology. The review of philosophical lit. (chiefly German) seems very elaborate ; it is a critical and select bibliography. Contents : (1) Der Krieg u. der Philosophie; (2) Einl. in d. Phil. ; (3) Geschichte d. Philos. (p. 14-42); (4) Logik u. Erkenntnistheorie; (5) Metaphysik u. Weltanschauungslehre; (6) Ethik ; (7) Aesthetik; (8) Religionsphilos. ; (9) Naturphilos. ; (10) Geschichts- u. Kulturphilos. ; (11) Rechts-, Gesellschafts- u. Staatsphilos. Indexes. G.S.

Spaulding, Edward Gleason, The new rationalism. The development of a constructive realism upon the basis of modern logic and science and through the criticism of opposed philosophical systems, XVIII + 532 p. New York, 1918. 1818

Vaihinger, Hans und Schmidt, Raymund (*editors*). Annalen der Philosophie, mit besonderer Rücksicht auf die Probleme der Als-Ob-Betrachtung. Erster Band, VIII + 681 S. Leipzig, MEINER, 1919. 1818

A new philosophical collection for the further elaboration of HANS VAIHINGER'S pragmatic philosophy, first explained by him in his *Philosophie des Als-Ob*, Berlin, 1911, 4th ed. Leipzig, 1920. This first vol. contains 15 essays considering the « As if » philosophy from as many different points of view. This philosophy is a new attempt to conciliate idealism and positivism. G. S.

25. — PHYSICS

Fowle, F. E. (*editor*). Smithsonian physical tables. Seventh revised edition, XLVI + 450 p. Washington, Smithsonian Institution, 1920. 1818

Karpinski, Louis C. A brief historical consideration of the metric system. *Science*, vol. 53, p. 156-157, 1921. 1819

Planck, Max. Die Entstehung und bisherige Entwicklung der Quantentheorie. 32 p. Leipzig, BARTH, 1920. 1818

Silberstein, L. Report on the quantum theory of spectra, IV + 42 p. London, HILGER, 1920. 1818

Soddy, Fred. Le radium. Interprétation et enseignement de la radioactivité. Trad. par A. LEPAPE (*Nouvelle collection scientifique*), 375 p. Paris, ALCAN, 1919. 1818

Translation of the third English ed., with appendix describing the progress made from 1914 to 1919.

Watt, Henry Jackson. The foundations of music, XIII + 240 p. Cambridge University Press, 1919. 1818

26. — PHYSIOLOGY

Arthur, Maurice. La physiologie. 430 p. Paris, MASSON, 1920. 1818

Haldane, John Scott. The new physiology and other addresses, VII + 156 p. London, GRIFFIN, 1919. 1818

Harvey, E. Newton. The nature of animal light (*Monographs in experimental biology and general physiology*), 182 p. Philadelphia, LIPPINCOTT, 1920. 1818

Keith, Arthur. The engines of the human body (*Christmas lectures at the Royal Institution*, 1916-1917), XII + 284 p. London, WILLIAMS and NORGATE, 1919. 1818

Parker, George Howard. The elementary nervous system, 229 p., 53 fig. Philadelphia, LIPPINCOTT, 1919. 1818

27. — PREHISTORY

Hoernes, Moriz. Urgeschichte der bildenden Kunst in Europa, von den Anfängen bis um 500 v. Chr. Zweite, durchaus umgearbeitete und neu illustrierte Auflage, mit 1330 Abb. im Text, XIV + 661 p. Wien, HOLZHAUSEN, 1915. 1820

First ed. 1898. A very valuable work of reference published with the assistance of the Kais. Akad. d. Wiss. — Main subdivisions : (1) Quellen u. Richtungen der bildenden Kunst; (2) Die prähistorische Kunst in Europa; (3) Der Westen u. die naturalistische Kunst des Jägertums; (4) Mitteleuropa u. die geometrische Kunst des Bauerntums; (5) Kulturkreise u. Kunstrichtungen der jüngeren Steinzeit u. der Kupferzeit; (6) Der Südosten u. der Kulturkreis der Bronzezeit; (7) Kulturkreise und Entwicklungen der Eisenzeit. Nachträge u. Nachweisungen. G. S.

Jackson, J. Wilfrid. Shells as evidence of the migrations of early culture, xxviii + 216 p., illustr. Manchester, University Press, 1917. 1818

Research inspired by Grafton Elliot Smith. G. S.

Kossinna, Gustaf. Die deutsche Vorgeschichte, eine hervorragend nationale Wissenschaft. 2te stark vermehrte Auflage. vii + 255p., illustr. (*Mannus Bibliothek*, 9). Würzburg, Kabitzsch, 1914. 1818

Miller Jr., Gerrit S. The Jaw of the Piltdown man. Smithsonian Miscellaneous Collections, vol. 65, nr 12, 31 p., 5 pl. Washington, 1915. 1818

Discussion of the published opinions on this subject and new study based on comparisons with other human jaws and skulls and the jaws of the *Pongidae* in the U. S. National Museum. Miller is convinced that the Piltdown jaw and the other skull fragments found near by do not belong to the same individual. Extensive and critical bibliography.

Moir, J. Reid. Pre-palæolithic man, 67 p., 29 pl. Ipswich, Harrison, [c. 1919]. 1818

Read, Carveth. The origin of man and of his superstitions, xii + 350 p. Cambridge University Press, 1920. 1818

Schuchhardt, Carl. Alteuropa in seiner Kultur-und Stilentwicklung, xii + 350 p. Strassburg, Trübner, 1919. 1818

Wilser, Ludwig (1850-). Deutsche Vorzeit. Einführung in die germanische Altertumskunde. 240 p., illustr. Steglitz-Berlin, Hobbing, 1917. 1818

28. — PSYCHOLOGY

Boirac, Emile (1851-) The psychology of the future. Transl. with an introd. by W. de Kerlor, ix + 316 p. London, Kegan, Paul, [c. 1918]. 1818

Carter, Huntly (*editor*). Spiritualism. Its present day meaning. A symposium. London, Fisher Unwin, 1920. 1818

Dessoir, Max (1867-). Vom Jenseits der Seele. Die Geheimwissenschaften in kritischer Betrachtung, viii + 344 p. Stuttgart, Enke, 1917. 1818

Knowlson, Thomas Sharnol. Originality. A popular study of the creative mind, xvi + 304 p. London, Werner Laurie, 1917. 1818

McCabe, Mac. Spiritualism. A popular history from 1847. London, Fisher Unwin, 1920. 1818

Preyer, William (1841-1897). Zur Psychologie des Schreibens mit besonderer Rücksicht auf individuelle Verschiedenheiten der Handschriften. 2. Auflage mit einer Ergänzung von Th. Preyer, vi + 256 p. Leipzig, Voss, 1919. [1. Aufl. 1895]. 1818

Psychic Research Quarterly, The, vol. I, no. I. July 1920. London, KEGAN PAUL, TRENCH, TRUBNER & Co. 1818

The aim of this new periodical is to stimulate the scientific study and reasoned criticism and discussion of psychical research. The first no. contains an excellent introductory essay by F. C. S. SCHILLER on Scientific method and psychical research, one by Sir WILLIAM BARRETT on the so-called Divining (or Dowsing) Rod and four others; also 5 book reviews. G. S.

Rabaud, Etienne. Prescience et causes actuelles dans l'instinct. *Scientia*, t. XXVII, p. 442-452. Bologna, 1920. 1818

Discussion of various experiments to destroy the superstitious exaggerations of the notion of instinct. G. S.

Schrenck von Notzing, Albert Philibert Franz, Freiherr von (1862-). Materialisationsphaenomene, ein Beitrag zur Erforschung der mediumistischen Telepathie, XI + 523 p., 150 fig , 30 pl. München, REINHARDT, 1914 [1913]. 1818

An English transl. with additions from a supplementary book by Baron von SCHRENCK, was published by KEGAN PAUL, London, c. 1920. G. S.

Smith, E. M. The investigation of mind in animals. IX + 194 p. Cambridge University Press, 1915. 1818

Tansley, Arthur George. The new psychology and its relation to life. London, ALLEN, 1920. 1818

Ward, James (1843-). Psychological principles, XIV + 478 p. Cambridge University Press, 1918. 1818

Watson, John B. Psychology from the standpoint of a behaviorist, 430 p. Philadelphia, LIPPINCOTT, 1919. 1818

Wundt, Wilhelm (1832-1920). Vorlesungen über die Menschen- und Tierseele, XVI + 579 p. Leipzig, Voss, 1919. 1818

29. — RELIGION. HISTORY OF RELIGION. RELIGION AND SCIENCE

Alfaric, Paul. Les écritures manichéennes. Leur constitution, leur histoire. Etude analytique, 2 vol., III + 154 + 240 p. Paris, NOURRY, 1918. 1818

Dussaud, René. Introduction à l'histoire des religions (*Bibliothèque historique des religions*, 1), VI + 292 p. Paris, LEROUX, 1914. 1818

Very clear and very well-informed summary of the fundamental religious facts with a generous account of the various theories devised to connect and to explain these facts. The plan is interesting : (1) Naturisme, animisme, préanimisme; (2) Totémisme; (3) Principe de vie; (4) Ame : (5) Dieux de la nature; (6) Dieux de groupe; (7) Représentations matérielles; (8) Sanctuaire; (9) et (10) Sacrifice; (11) Prière; (12) Mort; (13) Initiation et consécration. Fêtes; (14) Péché et Tabous; (15) Mythes et Dogmes; (16) Notions morales. His survey has led the author to the following minimum definition of religion (p. 290) : « une religion est constituée par un ensemble organisé de croyances et de rites qui se propose d'accroître et de perpétuer le principe de vie de l'individu, du groupe et de la nature. » G. S.

Gemelli, Fr. **Agostino** (O. F. M.). Religione e scienza (*Saggi apologetici*, II), XII + 347 p. Milano, Vita e Pensiero, 1920. 1818

A series of essays on the relations between positive science and religion from the Roman Catholic point of view. (I) Il conflitto di religione e scienza; (II) Bestie che pensano e che fanno di conti e... uomini che non ragionano; (III) I miracoli della biologia; (IV) Spiritismo e spiritisti; (V) Una epidemia diffusa dalle pratiche religiose; (VI) Il processo e la condanna di GALILEO. G. S.

Lake, **Kirsopp**. Landmarks in the history of early Christianity. London, MACMILLAN, 1920. 1818

Langer, **Fritz**. Intellectualmythologie. Betrachtungen über das Wesen des Mythus und die mythologische Methode, XII + 269 p. Leipzig, TEUBNER, 1916. 1818

Lods, **Ad.** L' « école de Strasbourg » et son influence sur l'étude des sciences religieuses en France au XIX^e^ siècle. *Revue de l'histoire des religions*, t. LXXXI, n° 2, mars 1920, p. 105-134. Paris, LEROUX. 1818

La France paraît montrer un intérêt croissant à l'histoire des religions : la fondation en 1920 de la « Société Ernest Renan » et de l' « Association française des Amis de l'Orient » (siège commun au Musée Guimet, Paris) constitue à cet égard un double indice. Dans ces conditions le retour de l'Alsace à la patrie française pourrait être un événement plein de promesses, si l'on pense qu'avant 1870 il n'y avait pas en France de plus actif foyer d'études religieuses que Strasbourg, et que depuis lors nombre des maîtres qui entretinrent à Paris l'intérêt pour ces études furent d'anciens élèves de l'Université alsacienne. M. AD. LODS rend donc un réel service en rappelant toute l'importance de l'œuvre accomplie par la Faculté de Théologie de Strasbourg, dont REUSS (1804-1891) et CHARLES SCHMIDT (1812-1895) furent les gloires. Œuvre d'adaptation de la science allemande à la pensée française; de développement de la haute culture au sein d'un luthéranisme auquel se montraient de plus en plus attentifs les calvinistes du sud de la France; mais œuvre scientifique aussi, puisqu'elle suscita des monuments tels que cette *Bible* dans laquelle REUSS se révèle initiateur de la théorie de WELLHAUSEN. P. MASSON-OURSEL.

Woodburne, **Angus Stewart**. The relation between religion and science. A biological approach. VII + 103 p. Chicago, University Press, 1920. 1818

30. — SCIENCE

B. — *History*

Brasch, Frederick E. The history of science section and the progress of science. *Science*, vol. 52, p. 559-562, 1920. 1818

Brasch, Frederick E. Report of the History of Science sessions of the American Association for the Advancement of science. (Dec. 27 1920 to Jan. 1, 1921, Chicago). *Science*, vol. 53, p. 315-318, 1921. 1818

Crew, Henry. The problem of the history of science in the college curriculum, *Scientific monthly*, vol. 10, p. 475-481, New York, 1920. 1818

Duhem, Pierre (1861-). La science allemande, 146 p. Paris, HERMANN, 1915. 1818

France. Ministère de l'instruction publique et des beaux-arts. La science française, 2 vol. illustrés de portraits. Paris, LAROUSSE, 1915. 1818

Matschoss, Conrad. Ein Besuch im Deutschen Museum in München. *Zeitschrift des Vereines deutscher Ingenieure*, p. 976 sq., illustr. Berlin, 1907. 1818

Miell, A. 11 contributod ato dai diversi paesi allo svilluppo della storia della scienza *Scientia*, t. XXIX, p. 89-100, 1 fevr. 1921. Trad. française : supplément, 21-32. 1818

Les grands noms de l'histoire de la science, les collections de classiques, les principaux périodiques. (Cette note sert en quelque sorte de préface à une enquête poursuivie par *Scientia* sur la contribution apportée par les divers pays au progrès des différentes branches de la science.) L. G.

München. Deutsches Museum von Meisterwerken der Naturwissenschaften und Technik. Rundgang durch die Sammlungen (21. bis 25. Tausend) 20 × 24.5, 40 p , 31 illustr. München [no date]. 1818

A short and well illustrated guide for the visitor to the Deutsches Museum, that is the Museum of the development of science and technology, founded in Munich in 1903 and which is already exceedingly rich and is admirably organized. This institution is partly supported by the subscriptions of its friends. G. S.

München. Deutsches Museum. Bericht über die unter dem Vorsitze Sr. Kgl. Hoheit des Prinzen LUDWIG von Bayern am 28 Juni 1903... erfolgte Gründung des Museum von Meisterwerken der Naturwissenschaft und Technik, 20 p., 32 × 21 cm. München, 1903. 1818

München. Deutsches Museum. Denkschrift über den Bibliothekbau des Deutschen Museums, 12 p., 32 × 21 cm., 10 illustr., 3 plates. München [no date]. 1818

Short description of the building itself and of its treasures : books, prints, MSS., autographs, coins, portraits. G. S.

München. Deutsches Museum. Denkschrift über den Neubau des Deutschen Museums, 30,5 × 20,5 cm., 12 p. München, 1920. 1818

Olschki, Leonardo. Die Literatur der Technik und der angewandten Wissenschaften vom Mittelalter bis zur Renaissance (Geschichte der neusprachlichen wissenschaftlichen Literatur, 1 Bd.), XII + 460 S. Heidelberg, C. WINTER, 1919. 1818

The aim of the author is to study the literature of science (or science from the literary point of view), but a deep union between substance and form could only exist when scientists began to use their own native tongue. After a relatively short chapter devoted to medieval literature, the author

studies successively the scientific writings and the personalities of : L. B. ALBERTI ; LORENZO GHIBERTI ; A. A. FILARETE ; FRANC. DI GIORGIO MARTINI ; PIERO DE' FRANCESCHI ; LUCA PACIOLI and finally LEONARDO DA VINCI (p. 252-413). Appendixes deal with A. DÜRER ; — the Latin translations of Arabic scientific writings ; — the duplication of the cube according to HEINRICH SCHREIBER and DÜRER. G. S.

Paoli, Humberto Julio. Contributi alla scienza sud americana, ed alla sua storia, e la « Colección de libros referentes à la ciencia hispano-americana ». *Archivio di storia della scienza*, t. I, p. 440-442. Roma, 1920. 1818

Short notes to announce the publication of a collection of reprints of the early South American scientific books with all necessary notes. The three first books to appear are : A. A. BARBA. *Arte de los metales...* (written 1640), Madrid 1729 ; MONARDES NICOLÁS. *Primera y Secunda y Tercera Partes de la Historia Medicinal...*, Sevilla 1580 ; PERES DE VERGOS. *Los nueve libros de re metallica...*, Madrid 1569. Dr H. J. PAOLI will edit these three volumes (address : Av. General Rodriquez 1669, Banfield, Argentine Rep.) G. S.

Sarton, George. Report to the Carnegie Institution of Washington [on his work from July 1919 to the end of August 1920]. Year Book No. 19 (1920), p. 383-385. Washington D. C. 1921. 1818

(1) Work in Europe (July 17, 1919 — Jan. 27, 1920) ; (2) History of Science ; (3) LEONARDO studies (interrupted) ; (4) History of physics in the nineteenth century ; (5) The new humanism. G. L.

Thorndike, Lynn. The Washington conference on the history of science. *Science*, vol. 53, p. 122, 1921. 1818

Report of conference held in Washington, Dec. 1920 at the same time that another conference was held in Chicago, for which see BRASCH' paper quoted above. G. S.

C. — *Organization*

Andrews, Roy Chapman. New expedition to Central Asia. *Natural History*, vol. xx, p. 349-355. New York, 1920. 1818

Attention is called upon this expedition partly because it will be the first great systematic attempt to study Central Asia, partly because it will be the basis of the Chinese Museum of Natural History to be founded in Peking, as a duplicate set of the collections will be left in China for that purpose. It may be also the beginning of an archæological survey of China. A special effort will be made in the field of palæoanthropology ; central Asiatic palæontology is still in its infancy. The work will be carried on under the name of « the third Asiatic expedition of the American Museum of Natural History, in coöperation with the American Asiatic Association and Asia Magazine ». the field work will last five years, and the estimated cost is $ 250.000. G. S.

Hale, George Ellery. The international organization of scientific research. *International Conciliation*, no. 154, p. 431-441. Greenwich, Conn., 1920. 1818

Explains the aims and organization of the International Research Council founded in Brussels, July 1919, after two preliminary inter-allied conferences in London, Oct. and Paris, Nov. 1918. This International council is a

federation of the various national research councils. Its permanent headquarters are in Brussels where it will meet triennially. HALE describes briefly a few other international scientific organizations devoted to special sciences. Although a child of hatred, let us hope that as years go by this organization will become really international. G. S.

Henderson, I. F. and W. D. A dictionary of scientific terms. Pronunciation, derivation and definition of terms in biology, botany, zoology, anatomy, cytology, embryology, physiology, VIII + 354 p. Edinburgh, OLIVER and BOYD, 1920. 1818

Kellogg, Vernon. The National Research Council. *International Conciliation*, no. 154, p. 423-430. Greenwich, Conn. 1920. 1819

Explains the aims of this « cooperative organization of the scientific men of America », improvised in 1916, reorganized in 1918 as a permanent body. It is established under the auspices of the National Academy of Sciences ; it is not at all a governmental institution. A gift of five million dollars from the Carnegie Corporation will be devoted partly to erect a building in Washington for the joint use of the Council and the National Academy, partly to endow the Council. G. S.

Leland, Waldo G. The International Union of Academies and the American Council of Learned Societies. *International Conciliation*, no. 154, p. 442-457. Greenwich, Conn., 1920. 1818

New « international » union organized in Paris, 1919 (first meeting Brussels 1920) to supersede the old union. Each country is entitled to two delegates and two votes; the headquarters are established in Brussels. This Union is the counterpart of the International Research Council, with regard to the so-called humanistic studies, that is : philosophy, philology, archæology, history, economics, and the political and social sciences. As the International Research Council, it was originally inspired by hatred rather than by love. — The American Council of Learned Societies was organized to insure an effective American participation in the activities of the new international union. G. S.

Mees, C. E. Kenneth. The organisation of industrial scientific technical research, IX + 175 p. New York, McGRAW-HILL, 1920. 1819

Merriam, John C. The research spirit in every day life of the average man. *Science*, vol. 52, p. 473-478. Nov. 19, 1920. 1818

Otlet, Paul. L'organisation des travaux scientifiques. Extrait du volume des conférences de l'Association française pour l'avancement des sciences, année 1919, 40 p. Paris, 28, rue Serpente. 1818

Développement des idées de l'auteur sur l'Organisation générale de la documentation, avec renvoi à ses travaux antérieurs. Il est impossible de résumer cet exposé si serré et si complet. Lecture mélancolique, car hélas! dans ce domaine le génie d'un homme reste impuissant s'il n'est secondé par la bonne volonté *unanime, soumise* et *continue* de milliers d'autres... Il n'y a qu'une sorte de religion qui pourrait créer le dévouement intarissable nécessaire à l'accomplissement d'une œuvre aussi vaste. G. S.

Pearson, Karl. The function of science in the modern state. Second edition, VII + 97 p. Cambridge University Press, 1919. 1818

First published as introduction to vol. 32 of the tenth ed. of the Encyclopædia Britannica.

Veblen, Thornstein B. The place of science in modern civilization 509 p. New-York, Huebsch, 1919. 1918

Wheeler, William Morton. The organization of research. *Science*, vol. 53, p. 53-67, 1921. 1918

A most interesting satire of the excesses of « organization » in science, full of wit and wisdom. G. S.

D. — *Philosophy*

Barrell, Joseph, Charles Schuchert, Lorande Loss Woodruff, Richard Swann Lull, Ellsworth Huntington. The evolution of the earth and its inhabitants, XI + 208 p. New Haven, Yale University Press, 1919. 1918

Elliot, Hugh. Modern science and materialism. 211 p. London, Longmans, 1919. 1918

More, Louis Trenchard. The limitations of science, 268 p. New York, Holt, 1915. 1918

Vailati, Giovanni [Crema, 1863-Firenze, 1906]. Gli strumenti della conoscenza. Con prefazione di Mario Calderoni. (*Cultura dell' anima*, 49). Lanciano, Carabba, 1919. 1918

Vailati was one of the best informed and the wisest men of contemporary Italy. A complete edition of his writings (excepting his Teoria delle Proporzioni, edited after his death by F. Enriques) was published in Florence, 1911. The present booklet reprints five papers, three of which are of special interest to the historian of science : (1) Sull' importanza delle ricerche relative alla storia delle scienze (1896); (2) Il metodo deduttivo come strumento di ricerca (1898); (3) Questioni di parola nella storia della scienza e della cultura (1898); (4) Sull' applicabilità dei concetti di causa e di effetto nelle scienze storiche (1903); (5) Pragmatismo e logica matematica (1906). A biography by Calderoni (17 p., 1909) and a bibliography are added. G. S.

Whitehead, A. N. An enquiry concerning the Principles of Natural Knowledge, XII + 200 p. Cambridge, University Press, 1919. 1918

Whitehead, A. N. The Concept of Nature. Tarner Lectures delivered in Trinity College, Nov. 1919, X + 202 p. Cambridge, University Press, 1920. 1918

A companionbook to the author's Enquiry concerning the Principles of Natural Knowledge, which dealt chiefly with ideas directly drawn from mathematical physics. The present book keeps closer to certain fields of philosophy and physics to the exclusion of mathematics. The two works meet in their discussions of space and time. G. S.

31. — SOCIOLOGY, JURISPRUDENCE AND POSITIVE POLITY

Beer, M. A history of British socialism. With an introduction by R. H. Tawney, 2 vol. XXII + 361, XII + 413 p. London, Bell, 1920. 1918

Completely rewritten translation of the original German text of 1912. Vol. I. (1) Mediæval communism; (2) 1760-1834. — Vol. II. (3) Chartism; (4) Modern socialism, 1855-1920. Elaborate indexes. G. S.

Burns, Cecil Delisle. Political ideals, their nature and development. Third edition, enlarged, 357 p. London, MILFORD, 1919. 1918

Dunning, William Archibald. A history of political theories, 3 vol. New York, MACMILLAN, 1902-1920. 1918

(I) 1902 (new ed. 1916) Ancient and mediæval; (II) 1905 (new ed. 1916). From LUTHER to MONTESQUIEU; (III) 1920. From ROUSSEAU to SPENCER.

Flexner, Abraham. Prostitution in Europe, IX + 455 p. Introduction by JOHN D. ROCKEFELLER, jr. New York, Century, 1919. 1918

Follet, Mary Parker. The new state; group organization, the solution of popular government. 3rd. impression. With introduction by Lord HALDANE. New York, LONGMANS, 1920 (cop. 1918). 1918

Goedeckemeyer, Albert. Die Idee vom ewigen Frieden. (Philosophische Zeitfragen), 77 S. Leipzig, FELIX MEINER, 1920. [M. 5] 1918

(1) Der Wert dieser Idee (includ. a short history); (2) Die Möglichkeit des ewigen Friedens; (3) Die Verwirklichung des ewigen Friedens. Schluss. G. S.

Guyot, Yves (1843-), **Germain Paturel, G. Schelle, J. Pierson, Frédéric Mathews.** Le libre échange international. Six conférences organisées en 1918 par la Ligue du Libre-Echange et l'Ecole des Hautes Etudes Sociales, IV + 228 p. Paris, ALCAN, 1918. 1918

Ireland, Alleyne. Democracy and the human equation. New York, DUTTON, 1921. 1918

Laski, Harold J. Authority in the modern state. 398 p. New Haven, YALE University Press, 1919. 1918

Müller-Lyer, Franz (1857-). The history of social development. Transl. by ELIZABETH C. and H. A. LAKE. 362 p. London, ALLEN [1920]. 1918

Pareto, Vilfredo (1848-). Traité de sociologie générale. Ed. française par PIERRE BOVEN, revue par l'auteur, 2 vol. Lausanne, PAYOT, 1917-1919. 1918

Rathenau, Walther (1864-). Die neue Gesellschaft. Berlin, FISCHER, 1919. 1918

English transl. by ARTHUR WINDHAM. The new society. New York, HARCOURT, 1921.

Ross, Edward Alsworth (1866-). The principles of sociology, XVIII + 708 p. New York, Century, 1920. 1918

Sayre, Francis Bowes. Experiments in international administration. Vol. I. 200 p. New York, HARPER, [1919]. 1918

Solvay, Ernest. Energétique sociale. La rémunération comparative du capital et du travail, 25 p. Bruxelles, F. van Buggenhoudt, 1919. 1918

Correspondance avec E. Vandervelde.

Trotter, W. Instincts of the herd in peace and war, 213 p. London, Unwin, 1916; New York, Macmillan, 1917. 1918

First two essays published in the *Sociological Review*, 1908-1909.

Vinogradov, Pavel Gavrilovich (1854-). Outlines of historical jurisprudence by Sir Paul Vinogradoff. Vol. I, ix + 428 p. London, Milford, 1920. 1918

Wheeler, William Morton. The termitodoxa, or biology and society. *The scientific monthly*, v. 10, p. 113-124. New York, Febr. 1920. 1918

A magnificent satire of human society which prof. Wheeler copied from a letter recently addressed to him by Wee-Wee, 43 d. Neotenic King of the 8429th. dynasty of bellicose termites. G. S.

32. — STATISTICS

Gini, Corrado (*editor*). Metron. International review of statistics. Vol. 1, no. 1. Rovigo (Veneto), Industrie grafiche italiane, July 1920. 1918

A new quarterly devoted to theoretical statistics and to the applications of general interest. The four numbers of each year will form a volume of 700 to 800 p., costing 50 lire. *Metron* will be an international center of information on all statistical matters. It will be published in four languages. Editorial committee : A. Andreadès, A.-E. Bunge, F.-P. Cantelli, L.-V. Furlan, M. Greenwood, G.-H. Knibbs, L. March, A. Julin, R. Pearl. Editor's address : Dept. of statistics, University of Padova, Italy.

Knibbs, George Handley (1858-). The mathematical theory of population, of its character and fluctuations and of the factors which influence it, etc. (*Report of the Australian census for 1911*, vol. I, Appendix A), xvi + 466 p. Melbourne, McCarron Bird Co, [1917]. 1918

The first vol. of this Report also contains a history of census-taking. G. S.

Simiand, François. La statistique comme moyen d'expérimentation et de preuve. *Journal de la société de statistique.* Paris, Février 1921, p. 37-49, 1921. 1918

33. — SUPERSTITION AND OCCULTISM

Bassett, Wilbur. Wanderships. Folk-stories of the sea, with notes upon their origin, 136 p. Chicago, Open Court, 1917. 1918

Besant, Annie and Charles W. Leadbetter. Occult chemistry. Clairvoyant observations on the chemical elements. Revised edition ed. by A. P. Sinnett, 110 p. London, Theosophical publishing house [c. 1919, not seen]. 1918

Clodd, Edward. Magic in names and in other things, 232 p. London, CHAPMANN, 1920. 1818

Dauzat, Albert. Légendes, prophéties et superstitions de la guerre. Paris, Renaissance du Livre, c. 1919. 1818

Ellis, Arthur J. [b. in Kansas 1885-d. 1920] The Divining Rod: a history of water witching. United States Geological Survey, Water-Supply paper 416, 59 p., 4 illustr. Washington, 1917. 1818

Brief history of the subject followed by an extensive bibliography in chronological order : from about 1532 (Ph. MELANCHTON, 15—; BERNHARDUS, 1532; AGRICOLA, 1556) until 1916. This bibliography occupies half of the book. KLINCKOWSTROEM's bibliogr (1911) and BIROT and ROUX's (1912) have been used. Introductory note by O. E. MEINZER. The text is divided as follows : form of the div. rod; its origin; spread of the delusion; origin of « water witching »; ecclesiastical controversies; use of the rod in detecting criminals; scientific controversies; mechanical water finders. The author was assistant chief of the Ground Water Division of the U. S. Geological Survey. A short obituary appeared in *Science*, vol. 52, p. 127, 1920. G. S.

Haenel, H. Zur physiologischen Mechanik der Wünschelrute. Mit einem Anhang : Beobachtungen an dem Rutengänger DONATH, mit 13 Abb. 42 p. (*Schriften des Verbands zur Klärung der Wünschelrutenfrage*). Stuttgart, WITTWER, 1918. 1818

The aim of the author has been to study in a scientific way not the explanation, but simply the mechanism of the divining rod. He lays special stress on the fact that the rotating mechanism of the hand (in supination and pronation) is extremely sensitive; the two delicate mechanisms of both hands added to the elasticity of the rod constitute an instrument of incredible sensitiveness. The substance searched for acts in some way upon the nervous system of the observer. The appendix is a study of the extraordinary rhabdomandist ADOLF DONATH. — Studies on the divining rod are classified in this section, simply because as long as these phenomena are not satisfactorily explained it is legitimate to call them « occult », but investigations as those undertaken by HAENEL and his friends should be encouraged, by all means. G. S.

Hellmann, G. Wetterpropheten des XIX. und XX. Jahrhunderts. *Beitr. zur Gesch. d. Meteorologie*, nr. 9, t. II, p. 233-314. Berlin, 1917 1818

By « weatherprophets », HELLMANN means men who believe that they can forecast the weather for long or even arbitrary periods. He does not include among them, those who have simply developed theoretical considerations on the possibility of such long-dated prevision. This memoir contains a large amount of information on 105 weather-prophets, among whom 36 Germans, 25 Englishmen, 14 Frenchmen, 9 North Americans, 8 Austro-Hungarians, 5 Swiss. This is a capital contribution to the history of human folly. — It grieves me to find LAMARCK's name in this list, but as he forecast the weather for a whole year ahead from 1800 to 1811, he deserves this opprobrium. G. S.

Hellwig, Albert. Weltkrieg und Aberglaube. Erlebtes und Erlauschtes. VIII + 159 p. Leipzig, HEIMS, 1916. 1818

Lippmann, Edmund O. von. Diamant und Bocksblut; ein Beitrag zur Volkskunde. *Chemiker Zeitung*, 1921, nr. 1 (Abdruck, 14 p.). 1818

Apropos of an old superstition according to which the blood of a he-goat can dissolve diamonds. LIPPMANN tells its history throughout the ages, the oldest source being PLINY'S *Natural History*, lib. 20, cap. 1; lib. 37, cap. 15.
G. S.

Spence, Lewis. An Encyclopædia of Occultism. A compendium of information on the occult sciences, occult personalities, psychic science, magic, demonology, spiritism and mysticism, XIV + 451 p, in 4°, illustr. London, ROUTLEDGE, 1920. 1819

A compilation which has been made very seriously by one who without believing in the occult, is open minded and sympathetic. As the first scientific effort of this kind, it will be very useful, although it is only as the author candidly admits, a beginning. Few references are given in the text but a short select bibliography is placed at the end of the introduction. Scientific hypotheses concerning magic have been summarized, though the author's main ambition has been rather to give as complete an account as possible of the magical facts and beliefs. G. S.

34. — TECHNOLOGY

(For mining, see geology; for industrial chemistry, chemistry. See also arts and crafts)

Artiñano y de Galdácano, Gervasio de. La arquitectura naval española (en Madera). Bosquejo de sus condiciones y rasgos de su evolución. (Conferencias organizados por el « Instituto de ingenieros civiles de España » en el Ateneo de Madrid, Mayo de 1914). [f°, 428 p., 80 pl.]. Editada en Madrid por el autor. Año de nuestra salud, MCMXX. 1813

A sumptuous publication enriched with a large collection of plates and illustrations (portraits, fac-similes of MSS., representations of ships, technical drawings, etc.). Many of the plates are in colour. This volume is a credit to Catalan typography. The text is divided into two main parts : (I) Beginnings and mediæval progress. Epoch of the House of Austria ; (II) The first fifty years of the Bourbons. G. S.

Dean, Bashford (1867-). Helmets and body armour in modern warfare. 325 p. New Haven, YALE University Press, 1920. 1818

[Feldhaus, Franz M.] Geschichte der Kugel-, Walzen- und Rollenlager, 56 S., 46 Abb. Schweinfurt a. M., Präzizions-Kugel-Lager-Werke FICHTEL und SACHS, [1914]. 1818

History of ball- and rollerbearings illustrated from the most important sources. The fruit of the collaboration between a great industrial concern and a great historical expert. When will the British and American business men follow this remarkable example ? There is a bibliography but it is to be regretted that the illustrations are not identified with more precision.
G. S.

Feldhaus, F. M. Modernste Kriegswaffen, alte Erfindungen. 240 S., viele Abbild. Leipzig, ABEL und MUELLER, [1915]. 1818

An heterogeneous collection of 139 short papers dealing with the history of arms and of other tools. Chiefly anecdotic, this book will appeal to the antiquarian rather than to the historian. It is useless as a reference book because of the absence of index and table of contents. G. S.

Feldhaus, Franz M. Die Geschichte der Schleifmittel. Mit einem Anhang von H. Friederichs. 83 S., 49 Abb. Hannover-Hainholz, Vereinigte Schmirgel- und Maschinenfabriken Aktien-Gesellschaft, 1919. 1818

A very complete history of polishing from prehistoric times until the middle of last century, with remarkable illustrations. The appendix deals with various polishing substances (emery, corundum, « Korubin », silicon carbide). G. S.

Fischer, Hermann. Beiträge zur Geschichte der Werkzeugmaschinen. Schmiedemaschinen. *Beitr. z. Gesch. d. Technik u. Industrie*, t. VI, p. 1-34, 54 Fig. Berlin, 1915. 1818

Häusser, Friedrich. Keltern einst und jetzt. Aus der Technik der Weines. *Beitr. z. Gesch. d. Technik und Industrie*, t. VII, p. 127-133, 6 Fig. Berlin, 1917. 1818

Hennig, Richard. Beiträge zur älteren Geschichte der Leuchttürme. *Beitr. z. Gesch. d. Technik u. Industrie*, t. VI, p. 35-54, 5 Fig. Berlin, 1915. 1818

Notes on beacons in ancient and mediæval times down to the xiith century. G. S.

Hennig, Richard. Beiträge zur Geschichte der Aeronautik. *Beitr. z. Gesch. d. Technik u. Industrie*, Bd. 8, 100-116. Berlin, 1918. 1818

Down to the time of Leonardo da Vinci. G. S.

Horwitz, Hugo Theodor. Beiträge zur aussereuropäischen und vorgeschichtlichen Technik. *Beitr. z. Gesch. d. Technik u. Industrie*, t. VII, p. 169-189, 34 Fig., Berlin, 1917. 1818

Johannsen, Otto. Die Quellen zur Geschichte der Eisengusses im Mittelalter und in der neueren Zeit bis zum Jahre 1530. 2te Fortsetzung. *Archiv für Gesch. d. Naturw.*, t. VIII, p. 66-81, 1917. 1818

See *Isis*, t. III, p. 153.

Moll, F. Die Entwicklung des Schiffsankers bis zum Jahre 1500 n. Chr. *Beitr. z. Gesch. d. Technik u. Industrie*, Bd. 9, p. 41-52, 5 Taf. Berlin, 1919. 1818

The development of anchors abundantly illustrated : pl. I contains 41 types taken from Greek coins (vith cent. B. C to 1st cent. after Christ); pl. II, 54 types from Roman coins (iiird cent. B. C. to iind. cent. after Christ); pl. III, 60 mediæval types (viith to xvith cent.); pl. IV represents actual remains of ancient anchors and anchors as drawn on the Bayeux tapestry ; pl. V, 42 more types of Christian times. Bibliography.

Stickelberger, Emanuel. Versuch einer Geschichte der Gerberei. 95 p., 36 illustr. Berlin, Springer, 1915 [not seen]. 1818

Vogel, Walther, Geschichte der deutschen Seeschiffahrt. I. Bd. Von der Urzeit bis zum Ende des XV. Jahrhunderts, XVII + 560 p. Berlin, REIMER, 1915. 1918

Wettich, Hans. Die Maschine in der Karikatur. Ein Buch zum Siege der Technik. 216 S., 260 Abb. Berlin, EYSLER, 1920. 1918

A large collection of drawings and cartoons of technological interest. Some of the illustrations are borrowed from MSS. or early printed books, the greatest number however are taken from nineteenth cent. or contemporary magazines. Special chapters are devoted to lifting-gears, windmills, suspension railways, ordinary railways, bicycles, automobiles, electric and magnetic-machines. The two last chapters deal with fantastic machines and machines as represented in commercial posters. A but too short conclusion is entitled : Machine in Art. G. S.

Wreden, Richard. Vorläufer und Entstehen der Kammerschleuse, ihre Würdigung und weitere Entwicklung. *Beitr. z. Gesch. d. Technik u. Industrie*, Bd. 9. p. 131-168, 24 Abb. Berlin, 1919. 1918

Die Vorläufer der Schiffahrt mit Schleusen. — Der ältere Schleusenbau Holland (oldest reference to a canal lock, dated 1155 ; oldest mention of a lock for shipping, 1243).— Der Uebergang von der einfachen zur doppelten Stauschleuse als Vorläufer der Schleppzugschleuse in Deutschland (locks about as ancient in Germany as in Holland).— Der Uebergang von der einseitig (unterhäuptig) geschlossenen Muschelschleuse (*conca*) in Italien zur Kammerschleuse (oldest Italian date, 1188 ; the first *conca* is mentioned in 1420 ; L. B. ALBERTI's improvements 1452 ; LEONARDO DA VINCI, before 1497, completes the system), etc. Elaborate bibliography. G. S.

35. — ZOOLOGY

Bouvier, C. L. La vie psychique des insectes (Bibliothèque de philosophie scientifique). 299 p. Paris, FLAMMARION, 1918. 1919

Dultz & Co. Evertebrata. Vererbungslehre. Hierin die Bibliothek des Herrn Prof. Dr. R. SEMON in München und ein Teil der Bibliothek des Herrn Prof. Dr. A. GOETTE in Strassburg, Antiquariats-Katalog 39, 61 S. München, Landwehrst., 6. 1921. 1919

1485 items of which only 83 deal with the theory of evolution. G. S.

Gilliéron, Jules (1854-). Généalogie des mots qui désignent l'abeille, d'après l'Atlas linguistique de la France, 360 p. Paris, CHAMPION, 1918. 1919

Joleaud, L. Revue de paléontologie animale. *Revue générale des sciences*, t. XXXI, p. 487-500. Paris, 1920. 1919

Survey of the progress made in 1917, 1918, 1919. G. S.

Kelling, K. Der Hund im deutschen Volkstum. Seine Stellung und Bedeutung in Sage, Sitte, Brauch, Glaube und Sprache unseres Volkes. 83 p. Neudamm, J. NEUMANN, 1914. 1919

Laufer, Berthold. The story of the Pinna and the Syrian lamb. *Journal of American folk-lore*, t. XXVIII, p. 103-128, 1915. 1919

Mennessier de la Lance, général **Gabriel René** (1835-). Essai de bibliographie hippique donnant la description détaillée des ouvrages publiés ou traduits en latin et en français sur le cheval et la cavalerie avec de nombreuses biographies d'auteurs hippiques. 2 vol. Paris, DORBON, 1915-1917. 1818

Thayer, **Gerald**. Concealing-coloration in the animal Kingdom. An exposition of the laws of disguise through color and pattern : being a summary of ABBOT H. THAYER's disclosures. With an introductory essay by A. H. THAYER. New ed. with a new preface. XVI col. pl., 140 fig., 4°, XIX + 260 p. New York, MACMILLAN, 1918. 1818

This book relating the observations and experiments of the great American painter A. H. THAYER, 1849-1921, was first published in 1909. It explains the theory of counter-shading (THAYER's Law, 1896), and the obliterative properties of some of the most gorgeous animal costumes. It gave a scientific basis to the practice of *camouflage* which took such importance during the war. Many admirable illustrations. G. S.